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DISCUSSIONS WITH PARENTS AND SUPPORTING  
CORRESPONDENCE RELATIVE TO INITIATING  
ORTHODONTIC TREATMENT

GEORGE M. ANDERSON, D.D.S., BALTIMORE, MD.

SOME weeks ago I had the pleasure of hearing H. I. Hayakawa, author of *Language in Action*, speak on "Words." It was a fascinating talk and one quotation in particular has remained with me. Hayakawa stated that to "live effectively is to live with adequate information."<sup>1</sup> We might paraphrase this to read "to practice effectively is to practice with adequate information." This applies not only to the practitioner of orthodontics but also to his patients and their parents. Hence the title of this presentation.

The layman's knowledge of orthodontic service is scant. Except for several popular type articles in magazines in recent years, there is little material parents may read as they face what to many of them is an expensive and complicated effort to provide their children with decent looking and useful teeth. The American Dental Association has provided a booklet entitled *Orthodontics: Questions and Answers* which the dental practitioner may use to provide a generalized sort of information to the parents. The Rocky Mountain Society of Orthodontists has made available a pamphlet and some orthodontists have worked up one for their own use, but over-all the scarcity of information for the public is all too true. Even the general dentist goes little beyond suggesting that the child patient may be developing a malocclusion and that the parent would do well to seek advice from an orthodontist. All too frequently no specific orthodontist is mentioned, the layman knows of no one, and the source of his information about available orthodontists is from the talkative neighbor. Under such haphazard circumstances the layman needs very careful handling and explanation, and the usually brief first time visit to arrange details is not the best way to provide for an amicable and understanding arrangement between the orthodontist and the layman parent. We must never forget that our work is seldom a short-time effort and that the patient is likely to be in our hands for a considerable period, during which the layman has time to make inquiries and to think about what he has done and ask himself whether he has done the

<sup>1</sup>Read before the Southern Society of Orthodontists, White Sulphur Springs, W. Va., July 30, 1951.

right thing. This can lead to repercussions and the situation can become difficult if the orthodontist has permitted himself to make insufficient, exaggerated, or inaccurate statements as to what needs to be done or what can be accomplished. A lack of understanding can plague the orthodontist throughout his corrective period.

The purpose of this presentation, however, is not to discuss generalized informative statements. The available pamphlets and articles in the literature are reasonably sufficient, serve a useful purpose, and what they say should be made available to parents of prospective patients. In this discussion we want to go much further than that. Parents are interested almost solely in what their own problem is and such details are wanted more than an over-all picture applying to everyone. Therefore, we are going to consider what we may do as a highly personalized effort with individual parents to clarify the mystical air of confusion in which many of them place their children for orthodontic service. As orthodontists we have a real problem. A patient should not be placed under treatment with parents wondering what most of the effort is about.

Neither should they be promised that a perfect result will be obtained. I have come reluctantly to the conclusion that a large proportion of our troubles stem from a form of egotism on our part wherein anyone can ask us to treat most anything and can leave our offices feeling that it will be done. From the first days of the specialty members have been unwilling to admit there are malocclusions which are not amenable to correction. We have, in ways much to our credit as professional men, wanted to do for patients more than in many instances could be done. We have not been satisfied to tell parents and patients that conditions existed which precluded benefits by orthodontic means. Specialty and individual reputations suffered and parental dissatisfaction developed under the impact of this attitude. The situation can be avoided by more forthrightness with ourselves, the dentist, and the patient, if, when under importunities to undertake a questionable result, the orthodontist would speak out, if he thinks the result the parent or dentist wants cannot be gotten. Our opportunity to lessen these difficulties rests in our willingness and ability to do this when we are consulted about treatment. We must forget perfection and think instead of improvement. We must make fewer promises as to what can be done and have a clear understanding before going ahead, and the best way to do this is to explain specialty and individual limitations.

Few of us have any training or education in this field of suitable explanation. There is little in the literature to help us. In fact, the scarcity of articles on this particular subject influenced me to write this paper. We seem, as individuals, to have just learned through experience, and what we know to do and how to do it is the first thing we have to do with and about our patients. We meet all sorts of parents, some readily understand, some have to have time to think, some just do not think, and some know more about it than we know. We seldom know much, if anything, about the parents when they first visit us and they know little about us. It is very possible if we knew more about each other, we would understand the other's problems better, as we initiate the arrangements for orthodontic treatment. Thereby, some later woes might

be avoided. Since it cannot be different, we should make the effort to explain fully the problems of treatment so as to lessen chances for dissatisfaction. However, the first consultation is not an especially good time to go into much detail. It really is and should be more of an acquaintance period.

About all that can be done at that time is grossly to tell the parents what the problem *seems* to be and decide what one needs to do to substantiate his opinion. This may include history taking in detail, impressions for plaster casts, x-rays (intraoral, extraoral, and cephalometric), and photographs. Data obtained therefrom and questions asked by the parents may then be answered verbally and later put in writing so that special emphasis may be laid upon important details.

*Both* parents should know. I learned long ago that it is not sufficient to inform the mother only as to treatment needs and plans, for the transmission of information under such circumstances is seldom in accord with what the orthodontist thinks he very definitely stated. I presume most of you have the initial talk with the mother. The father, who pays the bill, or in the majority of instances sends the checks, often accepts the undertaking as a necessary evil in the upbringing of his children. So long as he remains in good humor, his finances straight, his home life amicable, the progress of the case good, he is not likely to become too inquisitive about what is being done, or the circumstances concerned with the effort. This idealistic state does not always exist, and I believe that in every orthodontist's practice there comes a time when he wishes he had been a bit more explicit or positive about the general details incident to a particular case. It takes time to go to this effort, but if one has had unsatisfactory and unpleasant case terminations, he realizes that it is time well spent. Instances I can recall influenced me to start these precautions some years ago. Since doing so I have been much happier in my practice.

To those who have thought along these lines, the realization comes that it is hardly possible to be too informative with the layman, though one should be exceptionally careful to avoid discussions which lead to explanations involving clinical methods disagreements. In the effort to keep the record straight the practitioner should record or have his secretary take notes relative to specific questions raised by the parents. While very naturally much of what we think and say must be conveyed verbally, it is good practice to write an explanatory letter following advice that the patient will become a part of your practice. Four letters that have been written to parents prior to beginning treatment follow. One additional letter written to a dentist to advise him in his discussion with the parent will be included. The four cases have been selected from my files because they represent cases with particular interests which will become manifest as the letters are read. The third case, in particular, one of protrusive maxillary teeth, is of unusual interest diagnostically. While the issue involved was not projected to the parent in our letter, it is discussed at some length at the conclusion of this paper for it fits in very well as illustrative of problems currently confronting orthodontists which are still confusing us and about which we must be chary in our promises. No sort of controversy existed or developed in these instances, but they call attention to conditions of

patient acceptance which I wanted the parents to understand fully prior to beginning of treatment. These are not form letters; though a small part of each might be considered so, they are in the main individualistic and they answer questions raised by individual parents. They are not to be considered as perfect examples of what may be done, neither are they as detailed as many of you may think they should be, and some may think they are too long. But they do emphasize the problems about which I was most concerned for each case. They do not contain a lot of excess verbiage and expressions which may sound impressive but actually do nothing for the parent except confuse. That sort of thing can be worse than doing nothing. I recently read a letter, written by an orthodontist, which attempted to convey certain diagnostic and treatment information to the parents and the dentist which had to be reread to be reasonably understood. Imagine what a trial it must have been to the layman recipient. Even the dentist later asked me what some of the terms meant, saying he was lost in the confusion of words and expressions. Simplicity means for clarity and understanding.

The first important point is to realize that too frequently we see but one parent yet invariably two are involved. One, therefore, may hear a good deal about what is needed and the circumstances of treatment and the other know nothing, or possibly have a confused statement as to what we have said. It is wise and probably imperative, that, if the opportunity has not been had to talk with *both* parents, a letter be written and directed to *both*. This may take a bit of one's time but it also provides the parents with specific statements to which they can refer as they discuss the starting of treatment and gives them the opportunity to raise questions prior to actual beginning if they are not clear as to what the orthodontist can do or equally so as to what they can do. In fact, thoughtful people are most appreciative. Most men who send their children to orthodontists are persons who have been successful in their business efforts and they in turn develop a respect for the orthodontist as he states definitely and in writing the conditions surrounding this sort of contractual arrangement. This point is well substantiated by the following letter and reply:

My dear Mr. and Mrs. Z———.

It is my custom to write to the parents of my patients regarding the problems concerned with the orthodontic treatment of their children.

A——— has been kept under observation by me for a considerable period because she still had certain baby teeth which should be lost before treatment is started. At the present time she still retains some of these teeth but they are loosening, certain others have been lost and under the circumstances we can anticipate the permanent teeth erupting within a reasonable period. To start too soon means a slow treatment because no case is finished until all of the baby teeth are lost and new permanent teeth are in. In cases like A———'s where there is protrusion of the upper teeth [Fig. 1] with an apparent recession of the lower teeth (and in this instance A——— has the upper teeth pretty far forward), it becomes necessary at times to consider the extraction of a small tooth on either side of the upper jaw. Such extraction may become necessary because the space may be needed to retract the anterior teeth but the extraction is never entered into without further discussion with the parents and a specific written order given. I do not know whether such a procedure will become necessary for A———. I know that in some cases of this type it is so.

You will be interested in the cost or fee. It is based upon the type of case, length of treatment and in your instance a certain consideration which I choose to give. The first year fee is \$——; the second year fee is \$——. Thereafter any services will be rendered by an appointment charge of \$——. The first and second year fees may be paid as a matter of convenience in twelve parts annually. Other arrangements may be made if you so desire.

Enclosed herewith is a pamphlet and card containing information that I think is desirable for parents and a child to know prior to starting orthodontic treatment. If any question or problem arises either now or after A—— starts work I wish you would get in touch with me promptly so that I may answer your problem and thereby lessen any chance of misunderstanding or confusion concerning the treatment.



Fig. 1.—Same case as Fig. 2. Protrusive maxillary teeth.

I assure you of my cooperation and interest in A—— and if and when you decide to place her in my hands I shall do all possible to bring her treatment to a reasonably satisfactory conclusion. However, I do not want you to expect perfection in result. The beginning lines of my informative pamphlet state that "improvement" is to be expected rather than "perfection." It will take time and I caution people on this point because it is not possible to hurry teeth into the mouth and neither will they move beyond normal physiological limits.

When Mrs. Z—— was in with A—— I told her I did not know exactly the time when treatment could be best instituted. I did make photographs, x-rays and impressions of the teeth for study and as a result of looking them over I believe that anytime between now and Christmas would be suitable. There is no hurry but neither is there any further reason for delay.

Sincerely yours,

A reply received about three days after the previous letter was written is, I think, a good example of how the orthodontist's letter to the parent may

draw that parent out and permit the treatment to start under favorable circumstances:

Dear Dr. Anderson:

Thank you very much for your complete, precise and helpful letter of the 12th. Many of the questions that naturally come to our minds are fully answered by it.

We will appreciate your undertaking the orthodontic care of our daughter, A———, along the lines outlined in your letter. We shall leave entirely in your hands the decision as to when the treatment should be started. Naturally, our wish is that it be as soon as possible, but we realize the physiological limitations and will gladly abide by your decision in this matter, based solely on the selection of the time which will produce the best result.

Your decision as to the fee is very much appreciated. Please bill me semi-annually with the first billing being sent at the initiation of work.

Please accept our assurances of our confidence in your judgment in these matters and of our wish to make your work most effective by any supervision, explanation and training with which we can supplement it at home. Any instructions you may have in this regard will be appreciated.



Fig. 2.—Same case as Fig. 1. Protrusive incisors-lip relation.

Aside from the purely physical aspects of the problem there are two matters about which I would like to talk with you at your convenience.

The first is the possibility that A———'s somewhat indistinct enunciation may stem from her improper occlusion. If this is true, is there any likelihood that we may expect some improvement in that with a successful orthodontic result? Is there anything we can do in the way of training to make sure?

The second matter relates to her consciousness of the protruding upper teeth [Fig. 2]. There have been some minor comments about this with playmates and the consciousness of it does exist. However, there does not seem to be any morbid concern over it on A———'s part. I am sure your experience with this aspect has been broad and I will appreciate assurance from you that our present position of doing our best to ignore and minimize the problem in A———'s mind is the soundest approach.

Sincerely,

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I shall not go further into this case by citing my reply to the specific questions but they were answered promptly and at length to the satisfaction of the parents.

Not all of my patients have such favorable parent understanding. I have had a good many odd experiences. On many occasions, as with the preceding letter, I have had parents thank me for giving them an opportunity to discuss matters with me. They have said in communicating with me after receipt of my letter that they would not have felt free to do so had they not received the explanatory letter from me. Several have stated that they wanted to call me after hearing the wife's explanation but felt I might construe it as a criticism for not making things clear or that I might consider the call a reflection on the wife and her attentiveness. So they had refrained from calling. In these instances I felt grateful that I, too, had had the opportunity to get things straight so that over the long period of corrective effort the parents would not have been laboring under confusion which eventually could have broken down into a faulty situation. In another instance, after talking at length with a mother, I saw fit to direct a letter to both parents and received from the father a telephone call which was so irritating in its tone and manner that I almost hung up on him. The reason was eventually made clear through his remarks: mother and father were having difficulties, and it was not the intent of the father to do anything that his wife saw fit even though eventually he did assume the burden incident to treatment.

There is seldom any part of the orthodontic effort that needs to be rushed in starting to a point wherein you cannot take the time and make the effort to have the diagnostic, corrective, and financial problems fully known by the contracting parties. Therefore, we consider the verbal discussion during the first visit as but a preliminary phase and supplement it with a letter in which we emphasize the problems of especial interest to parent or child, or those issues about which we as orthodontists are especially concerned. It also incorporates the salient features of our previous discussions in order to establish a permanent record as to what we are planning to do and as to what is expected of the parents and patient. The first important thing is that one knows clearly what his problem is, and secondly that he inform the parents in nontechnical language, for he cannot expect people to understand what he says if he does so in words which they may never have heard before. In support of what I have said in this paper, I am going to read two additional letters which I wrote to parents:

My dear Mr. and Mrs. ————:

It is my custom to write to the parents of my patients regarding the problems concerned with the orthodontic treatment proposed for their children. I have seen S——— for a long time and have not seen fit to institute orthodontic treatment because I did not think, until the present, that she had reached the stage where we might make reasonable progress.

S———'s chief problem is concerned with what we term a deep overbite. It is too much of an overlap of the upper teeth over the lower [Fig. 3], whereby the lower teeth, in front, strike inside the upper front teeth too deeply, at times even embedding themselves, when the teeth are closed in the palatal tissues or the roof of the mouth. This is not good for the present and bodes ill for the future. There is some irregularity of the teeth [Fig. 4] and S——— has been unfortunate to have certain of her teeth injured with actual breakage forming irregular edges of the incisor teeth. A lower incisor tooth is what we call "dead" [Fig. 5]. The root canal has been filled, in what appears to be a successful manner. No one knows the outcome of these so-called dead

teeth with root canal fillings but I have seen many of them last for many years and prove satisfactory. That is the assumption I have in regard to this one. If, however, it should go bad you will understand the pathology or background concerned with it and that all has been done that could be done to keep it sound and useful. In addition, we found a

Fig. 3.



Fig. 4.



Fig. 5.

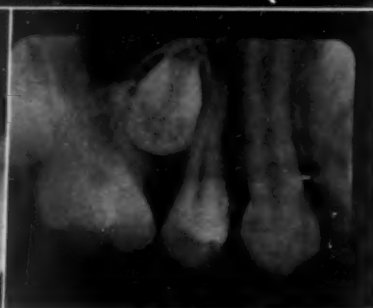


Fig. 6.

Fig. 3.—Deep overbite.

Fig. 4.—Same case as Fig. 3. Some irregularity of the teeth. Deep overbite.

Fig. 5.—“Dead” incisor.

Fig. 6.—Unerupted displaced second bicuspid.

deficiency in the number of teeth for S———. This is not an infrequent occurrence with our patients. S——— is congenitally missing three second bicuspid. She has but one; she should naturally have four. The one is on the upper left side and the tooth is not in good position [Fig. 6]. In order to bring harmony and balance and have a

uniform number of teeth in each quadrant of the mouth it is possible that either the first bicuspid which is now erupted and in place or the unerupted second bicuspid will have to be taken out. But we have plenty of time to consider that problem and can handle it in due course. I mention it now so that you will understand if and when a suggestion is made for extraction, it is based on long time observation and is in accord with the needs of S———'s case and our previous consideration of the matter.

Cases such as S——— have shown the desired improvement in about two years of active work. No one can say specifically as to the time because until you try to move childrens' teeth and see what can be done with each individual case you never know how fast or with what sureness anything will happen. Like cases, however, have done well as stated and let us hope that S——— will.

These cases are a long time procedure and difficult to do. Each person has to co-operate with the other, but, in the end, if we all do our part, the result usually comes about and we can all be very happy about it. In S———'s instance, there will be a long time retention after treatment is actually completed. That retention consists of wearing a removable plate at night. When worn as instructed and for as long as I say, I find very little trouble in the support and maintenance of the corrected position of the teeth. It is when people forget that they must support the teeth for a long time after they have been moved and fail to wear the retainer, that we get into trouble. I believe, however, that I will be able to impress upon S——— the need for cooperating in this respect after we have done the main job. I assure you I will make every effort to do so and I have gotten along well with her so far and have no reason to think that she will not do all the things that we ask of her. I am very glad to have her for a patient.

The fee for the treatment of S——— is based upon the assumption that the main part of the work can be done in approximately two years. The first year fee is \$———; the second year fee is \$———; any service after the second year will be rendered by an appointment charge of \$——— each. A majority of parents pay me in twelve parts annually, but, you have asked if you might pay at the end of the first year the full amount for that year and I told you I would be agreeable, if that was convenient and more satisfactory to you. In other words, I am interested in doing for S——— what can be done and the money, while important, takes its proper place in the proceedings, which is nothing more than paying for what you get and I have no objection to anyone arranging payment procedures in a manner that will make it more convenient and satisfactory for them.

I assure you of my interest in S——— and am enclosing a pamphlet and card which I wish you would read and have her read. Also, if at any time a problem arises I would like you to get in touch with me promptly so that we may discuss it and settle the issue.

Sincerely yours,

---

As with the letter just read the following letter seemed indicated in order to answer questions and settle points which were raised at the consultation period. The father, who had recently transferred his business interests to Baltimore, had been especially interested in various phases of the orthodontic problem and was not backward about asking my viewpoint concerning them. The issues raised could conceivably have become annoying during the treatment period and it seemed the sensible thing to clarify them before going ahead. The letter seemed to accomplish a satisfying working base, for shortly after writing it I received the "go-ahead" signal.

My dear Mr. and Mrs. X———:

Following my usual custom when beginning to treat a child for malocclusion of the teeth, I am writing you an outline of the procedure relative to J———'s case.

J——— has a narrow upper jaw [Fig. 7] and a protrusion of the upper incisor teeth complicated with what we call a deep overbite which is an excessive overlap of the upper front teeth to the lower front teeth. This type of case is usually amenable to treatment in an approximate period of two years of active work, following which is a retentive period, during which the result obtained must be held by the means of small plates which are worn at night only for an indefinite period. During the treatment period it may be necessary, if the result does not seem to be shaping up satisfactorily, to consider the removal of a small tooth on either side of the upper jaw. The space provided by this extraction is utilized to realign the other teeth. No extraction is ever entered into without further discussion with parents, and the reasons are given why it seems necessary to consider such a measure.

Appointments during the treatment are about every two or three weeks after we once get started. The reason for the interval is to allow time for bone changes to occur so that what we bring about will have every natural chance to be permanent and stable.



Fig. 7.—Protrusive maxillary teeth. Molar relation that of typical "distocclusion." See Figs. 13 and 14, discussion concerning this questionable diagnosis.

The fee arrangement is based upon two years of active treatment and the retentive period thereafter. It is \$——— the first year; \$——— the second year, and after the second year, treatment is by means of an appointment charge, minimum of \$——— and a maximum of \$———. The first year's fee and the second years' fee may be divided into twelve parts annually for convenience of payment.

Enclosed you will find a pamphlet and card which I wish you would read as they contain information of value relating to treatment.

The fee stated includes all services in this office but does not include filling of teeth or extraction of teeth, which work I do not include in the services that I render the public.

I will arrange, if during the period of treatment, you are transferred from Baltimore, to see that you are referred into competent hands. Arrangements however, for treatment thereafter, would be made by you direct with the person to whom I refer you. However, your arrangements with me would cease at the time you leave, whether it be early in the treatment or late in the treatment. In other words, you would not be placed under double treatment expense.

I assure you of my interest in J——— and desire to do for him all that I can. Cooperation on his part is essential and I hope we will have it. If at any time any

circumstances arise that you do not understand, let me know, please, and we shall discuss the matter so that it may be worked out favorably to all concerned.

Very truly yours,

Each of the previous letters referred to patients to be placed under treatment. We see patients for whom orthodontic treatment is inadvisable or for whom it should be delayed until questionable conditions are better understood.

A.



B.

Fig. 8.—A, Large mandible; B, incisal apposition of teeth.

Among them are extremely carious teeth, bad oral hygiene, temperamental maladjustments, pathological and congenital or inherited malformations over which we have little, if any, control. The following letter relates to the latter group. I consider a clear statement as to the reasons for withholding treatment as important as the advocacy of complete understanding prior to beginning treatment.

My dear Mr. and Mrs. W.:

You brought A——— to me on the recommendation of your dentist, Dr. B——— to see what might be done regarding the position of his teeth. At times the work we do is related solely to a betterment of position of irregular teeth. In other instances our work becomes involved with general physical conditions which have caused the unusual

tooth position about which the parent seeks consultation. Prior to seeing A——— I was impressed with the fact that I might be seeing the unusual. Dr. B——— has referred many patients to me and in certain instances he has discussed with me by telephone what he had noticed over previous months of observation. In A———'s case he has been concerned with the size of the lower jaw [Fig. 8, A and B] which has seemed to be growing larger, as well as the malposition of the teeth. This may seem to be an inherited condition and the jaw eventually reaches a limit of growth. In other instances, the jaw seems to have no limit of growth and medical examination may indicate a glandular disturbance. The gland involved, the pituitary (you may have heard of it or it may be an entirely new term to you), is centered in the skull and affects and controls human growth. The extremities in particular are affected. These are the hands, feet and the lower jaw. I am not qualified to judge a glandular involvement—it is a medical problem and usually requires more than your family physician to diagnose though he should first be consulted. I have x-rays of each side of the lower jaw [Fig. 9], as well as of the gland area of the skull [Fig. 10] which can be made available to either the family physician or the specialist. I recommend a consultation so that if the possibility I suggest actually exists suitable treatment can be given.

The above data relates, as you will note, but little to the teeth. For me to be able to correct the malposition of the teeth I must know of the causes of the jaw condition. If they can be recognized and corrected then I am in a better position to succeed in my job. If the causative factors continue to exist during my treatment and persist afterwards I am apt to fail in my efforts. Hence my decision as to when to try to do anything for A——— will have to wait until I receive a medical report.

If favorable, I will do all I can with appliances on A———'s teeth to correct the malrelation of the upper and lower teeth and while I may get some improvement I want you as parents and Dr. B——— as the dentist to know that nothing I do will alter the size of the lower jaw. There is a largeness now apparent that tooth positioning cannot lessen. Full correction, therefore, even under most favorable medical conditions should not be expected.

There is one other phase of the problem about which you should know a little. Surgery has been resorted to in these large lower jaws but it should be considered only after other measures, such as orthodontic treatment, have been tried. Since the eventuality is far in the future, you need not at present be too concerned about it. It is mentioned now so that you may be fully acquainted with all possibilities for A———'s betterment.

I shall await a medical report before having further discussion with you.

Very truly yours,

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In the first paragraph of this paper your attention was called to the dentist's limited knowledge or an indifference to the need for explanation to the parents relative to orthodontic treatment. As orthodontists we have the responsibility to see that this is changed. Such an attitude can adversely affect our work. It is, therefore, much to our advantage to see that it is changed. Letters, such as I have suggested, offer a fine opportunity, and I have made it a part of my effort to see that a copy of the major portion of my letter to the parents is sent to the dentist. I do not include the paragraphs relating to the fee arrangement. The letter seems to be appreciated and there is no doubt that the family dentist knows something of our problem in relation to his patient, and in particular he understands what the parent has been told so that all interested parties talk the same language. As time passes and further discussion of the case seems necessary, the dentist, parent, and orthodontist can discuss

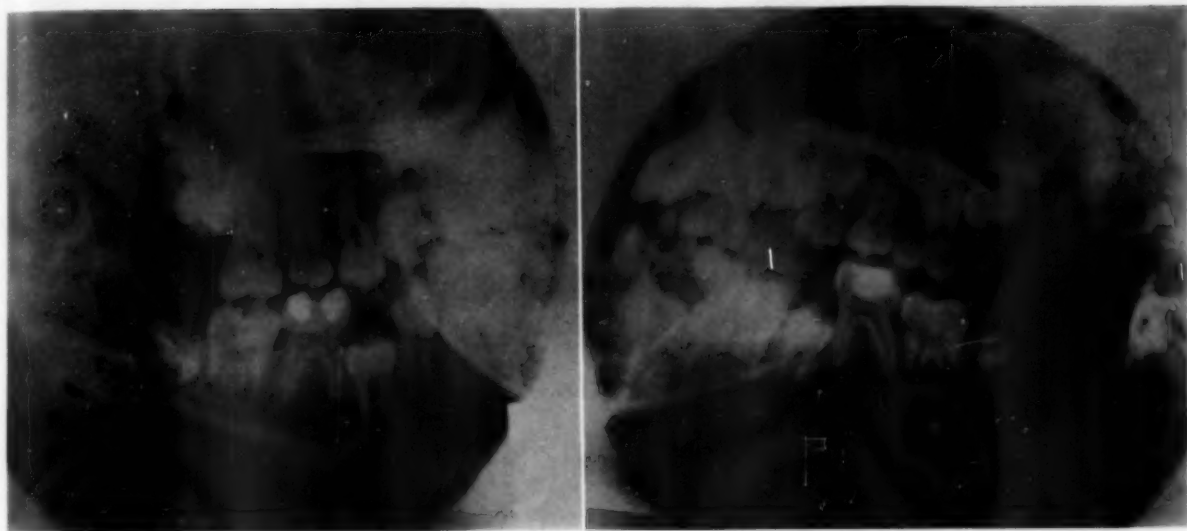


Fig. 9.—Molar and bicuspid occlusion and size of body of mandible of interest in diagnosis and prognosis.



Fig. 10.—Same case as Fig. 8, *A* and *B*, and Fig. 9.

issues in a more understandable way. The purpose of this article, however, is for parent-orthodontist understanding and not for parent-dentist-orthodontist. To include the latter to any appreciable degree would lengthen this article beyond reasonable limits. However, I shall illustrate an interesting case about which I was asked recently to advise a dentist, who would then talk with the parent. Under such circumstances, I am especially anxious to have recorded what I say. Telephonic conversations are not very satisfactory and may lead to confusion and later differences of opinion as to the course which should have been followed. On March 24, 1951, a patient brought in the following note:

I would like your opinion on whether or not to extract the lower left and the lower right first bicuspid to allow the second bicuspid (which are impacted) to come up. Bitewing X-rays are enclosed.

**My reply stated:**

Thank you for sending the bitewing films of ——— which show unerupted lower second bicuspid and your note requesting an opinion states that you are interested in whether it is wise to extract the erupted first bicuspid so that the seconds may erupt into position.



Fig. 11.—Unerupted mandibular second bicuspid with lingual eruptive tilt indicated by occlusal surface being so evident in the bicuspid.

I have checked further on this problem with extraoral X-rays [Fig. 11] and an occlusal view [Fig. 12]. They are available for your information in case you wish to see them.

These films indicate the real position of the unerupted second bicuspid. They are slanting lingually, somewhat like the leaning tower of Pisa, though they appear upright. Clinical examination shows the lingual plate of bone bulging somewhat indicating the second bicuspid will probably continue to erupt in that direction. Therefore, I would not extract the erupted first bicuspid as they are in place, for the second bicuspid might not erupt in nearly as favorable occlusal position or relation.

I would prefer to plan to extract the unerupted *second* bicuspid in about a year since by that time they may either have come into the mouth or be far enough deflected to make removal feasible.

I am returning your x-rays and suggest you consider the extraction as recommended in about a year. I will be glad to see the patient again at that time and check over my recommendations.

Very truly yours,

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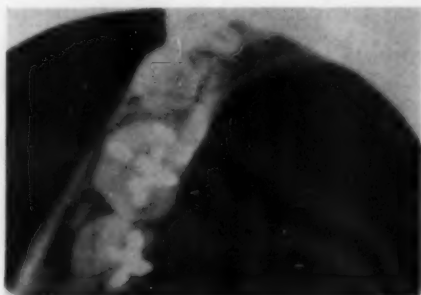


Fig. 12.—Same case as Fig. 11. Occlusal view of unerupted lingually tilted second bicuspid.

#### SEQUEL

The outcome of these cases may be of interest to you, both as to treatment procedures and whether any circumstances arose contrary to what had been anticipated.

Case 1 (Figs. 1 and 2) was uneventful in the correction of the protrusion. Extraction was not required though the possibility had been mentioned. The lip line affected by the protrusive incisors was fairly well relieved. The appliances used were the simplest form of labiolingual with intermaxillary elastics. Treatment length to placement of removable retainers was within the estimated period.

Case 2 (Figs. 3, 4, 5, and 6), with irregular incisors, deep overbite, unerupted second bicuspid, and nonvital mandibular incisor, is in process of correction. Fifteen months of an estimated two-year period have passed. The mandibular incisor is still sound and the overbite practically eliminated. The appliances, which consisted of maxillary twin wire and incisor bands, acrylic bite plate attached to maxillary lingual arch, mandibular lingual arch, and intermaxillary elastics, were removed in June, 1951, so that a removable retainer to be worn at night only might be used while the patient was in summer camp.

Case 3 (Fig. 7) is the most interesting for it illustrates a type of malocclusion which is a frequent occurrence in orthodontic practice. For years we have considered it a type about which there is a serious diagnostic question and evidence points that we have been incorrect. What we have called distocclusion of the mandibular teeth is in reality in many instances a mesiocclusion of the maxillary teeth with no mandibular recession or deficiency of growth. The appearance is that of distocclusion but it is a misleading appearance.

For correction of this case I diagnosed it as *protrusive maxillary teeth*. In treatment I used labiolingual appliances. The maxillary labial arch was kept slightly forward or off the incisors so that the pull of the intermaxillary elastics was first felt in the molar region. As the molar teeth moved distally the labial arch came to touch the incisors and these teeth were carried inward a bit, before further adjustment of the labial arch to be free of the incisors. The previous tooth movement was then repeated through the use of the intermaxillary elastics. There was a brief use of an acrylic bite plate attached to a maxillary lingual arch. Correction was rapid; in about a year a major part had been accomplished, though two years had been anticipated (Fig. 13). The rapid and satisfactory result convinced me that my diagnosis had been correct and that I had not been faced with a true distoclusion but rather with a false distoclusion, in reality, a mesial positioning of the entire maxillary arch resulting in protrusive incisors with little, if any, mandibular involvement. Note the first permanent molar relation in the photograph of the x-ray taken at the beginning of treatment (Fig. 14) and the relation of these same molars in the photograph of the x-ray taken at the end of the year (Fig. 15). A "distoclusal" relationship is shown in the first picture (Fig. 14) and a "normal" relationship in the second (Fig. 15). A great relative change in molar positioning has occurred and there seems to be no bad effect on the position of the second and third molars. I believe a true distal movement of the maxillary teeth was obtained, returning these teeth to their normal cranial position, and little, if any, change occurred in the positioning of the mandibular dental arch in relation to the maxillary. The result and the manner of obtaining it clinically satisfies me that this case was a false distoclusion.

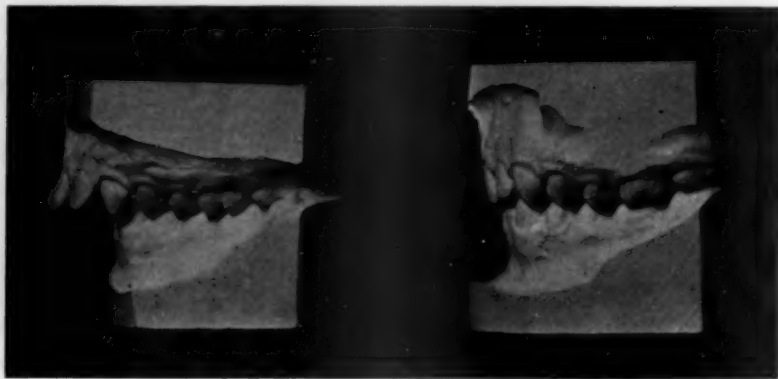


Fig. 13.—Same case as Fig. 7, before and after treatment.

One important diagnostic point is the appearance of the mandibular teeth in a true distoclusion and in a false one. In a true distoclusion the mandibular dental arch is usually crowded, the incisors, in particular, being bunched. This is a result of congenital or developmental deficiency and the whole dental arch seems to be small with the over-all mandibular size likewise. In a false-appearing distoclusion or one like the case described in this report, the mandibular arch and teeth are usually very good. In fact, when the mandibular

area alone is examined there seems to be nothing wrong and treatment is not needed. The malocclusion is essentially in the maxillary area. My study of this problem over the years<sup>2</sup> provides many cases to substantiate this diagnostic

Fig. 14.

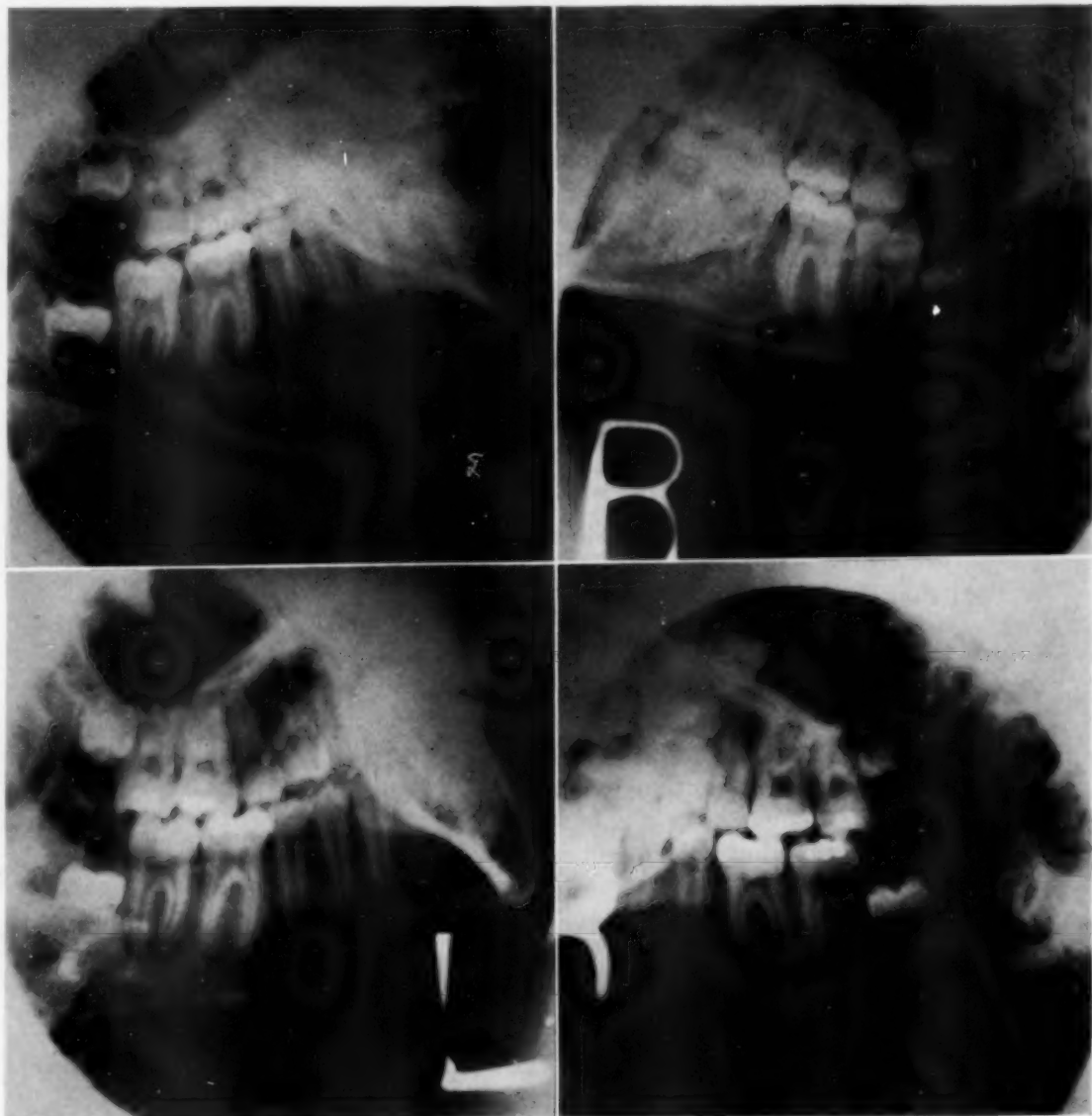


Fig. 15.

Fig. 14.—Same case as Figs. 7 and 13. Distocclusion (note molar occlusion).

Fig. 15.—Same case as Figs. 7, 13, and 14. "Normal" occlusion of molars following treatment of distocclusion (?), or was the case as shown in Fig. 14 a mesial positioning of the maxillary arch creating a false distocclusion?

picture of true and false distocclusion, and that we find few distocclusions of the mandibular arch in comparison to the number of mesiocclusions of the maxillary teeth as we study the over-all picture of protrusive teeth. When we do find a true distocclusion we can feel reasonably sure that it is a result of a congenital

malformation or developmental deficiency rather than a localized occlusal disharmony, and the prognosis is not good. In fact, true distocclusions are a type of malocclusion about which we are very specific to the parents of our patients in explaining treatment limitations as we discuss what we hope to do when we undertake treatment.

Case 4 has had no treatment but there is no history of glandular involvement. Inheritable factors loom as an etiological consideration.

From what I have written, I sincerely hope I have been able to prove that better working conditions can be made to exist. It represents time-consuming effort but also eliminates nerve-wracking dissensions.

If this paper, through response after publication, seems to have merit and create interest, we can develop another relative to the referral conditions under which the orthodontist and the dentist work. In fact, this paper may be considered as the second of a series,<sup>3</sup> the first, in which office and practice management was discussed, having been written and read some years ago. Though several years have passed, communications still evidence an interest in that subject.

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831 PARK AVE.

# SUTURAL FACIAL GROWTH OF THE MACACA RHESUS MONKEY: A GROSS AND SERIAL ROENTGENOGRAPHIC STUDY BY MEANS OF METALLIC IMPLANTS

BENJAMIN J. GANS, D.D.S., M.S.,\* \*\* AND BERNARD G. SARNAT, M.D., M.S.,  
D.D.S.,\* \*\*\* CHICAGO, ILL.

## INTRODUCTION AND PURPOSE

**F**ACIAL harmony is dependent upon the coordinated growth of the jaws, facial bones, and related structures. Understanding of normal craniofacial growth forms the basis for early recognition and proper treatment of facial deformities. Recent reports<sup>1-4</sup> have emphasized the increasing need for further information about normal facial growth.

The purposes of this experimental study in the *Macaca rhesus* monkey were: (1) to compare the relative amounts of sutural growth in selected areas of the face by means of metallic implants; (2) to compare the roentgenographic with the direct method of measuring growth by means of metallic implants; (3) to study the direction of growth of certain components of the facial skeleton by superpositioning tracings of serially taken roentgenograms.

## REVIEW OF THE LITERATURE

Our knowledge regarding craniofacial growth has been determined principally in two ways. The first, a cross-sectional approach, has utilized a large number of skulls of varying ages.<sup>5-7</sup> This method is a static one in the sense that growth studies can be made only by comparison of measurements taken on skulls of different age groups. The second, a longitudinal approach, has utilized a selected number of subjects. This method is a dynamic one in the sense that serial measurements can be made on the same growing individual and the actual amount of growth can thus be evaluated.

Four principal methods have been employed in longitudinal studies:

1. Vital staining by means of madder and alizarin red S.<sup>8-13</sup>
2. External head measurements.<sup>14, 15</sup>
3. Metallic implants. These were first used in the study of long bone growth by Hales<sup>16</sup> as early as 1727 and by Duhamel<sup>8</sup> in 1739. Two wire loops,

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\*Department of Oral and Maxillofacial Surgery, College of Dentistry, University of Illinois.

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\*\*\*Department of Surgery (Plastic Surgery), College of Medicine, University of Illinois.

TABLE I\*

MACACA RHESUS MONKEY	SEX	AGE** OF ANIMAL (IN DAYS) DURING EXPERIMENT		DURATION OF EXPERIMENT (DAYS)	SUTURAL GROWTH IN MM. AS MEASURED DIRECTLY (SKULL) AND INDIRECTLY (ROENTGENOGRAMS)									
					FRONTO- ZYGOMATIC		FRONTO- MAXILLARY		ZYGOMATICO- TEMPORAL		ZYGOMATICO- MAXILLARY		PREMAXILLO- MAXILLARY	
		BEGINNING	END		SKULL	X-RAY	SKULL	X-RAY	SKULL	X-RAY	SKULL	X-RAY	SKULL	X-RAY
23	♂	240	451	211	0.5	0.3	0.5	0.3	3.3	3.3	1.4	1.3	0.3	0.4
21	♂	240	457	217	0.8	0.8	2.0	2.0	1.9	1.9	1.2	1.2	0.6	0.6
22	♀	240	467	227	***	***	***	***	1.7	1.7	1.1	1.1	1.4	1.4
20	♂	240	471	231	0	0	0.2	0.2	2.5	2.5	1.0	1.0	0.7	0.7
8	♀	540	838	298	0.7	0.6	0.7	0.6	2.3	2.3	***0.3	***0.2	1.1	1.2
12	♀	540	876	336	0.8	1.1	0.8	1.0	2.3	2.3	1.0	1.0	1.0	0.6
1	♂	720	1,060	340	0	0	0	0	0.2	0.2	0	0	0.2	0.1
3	♂	720	1,068	348	0.8	0.8	0.9	0.9	0.8	0.8	0.2	0.2	0.9	0.9

\*Amount of growth occurring at sutural areas as determined by the difference between the distance of paired metallic implants at the beginning and termination of the experiment. Note greatest amount of growth to be in the area of the zygomaticotemporal suture. Also compare growth as determined by direct measurements on the skulls and indirect measurements made on the roentgenograms.

\*\*Approximate age according to dentition.

\*\*\*Implants lost during experiment.

one to encircle the posterior and the other the anterior border of the ramus, were inserted by Humphry<sup>17</sup> to study growth of the pig mandible. Amalgam implants, on each side of three cranial sutures, were combined with vital staining by Levine<sup>12</sup> in an effort to study cranial growth of the rabbit.

4. Serial cephalometric roentgenograms. The use of x-rays in the anthropometry of the skull was suggested by Pacini<sup>18</sup> in 1922. Controlled serial cephalometric roentgenography was simultaneously but independently reported by Broadbent<sup>19, 20</sup> and Hofrath<sup>21</sup> in 1931. This method was applied to the longitudinal study of growing human male children from the third month to the eighth year of life by Brodie.<sup>22</sup>

Two of the methods mentioned, i.e., serial cephalometric roentgenography and metallic implants (gold foil) were combined by Hulen<sup>23</sup> and Black<sup>24</sup> in the growth study of the dog palate and mandible. There is no report, however, showing the role played by external facial sutures in the growth of the face using direct measurements (taken on the skull) in combination with indirect measurements (taken on the roentgenogram). The sutures studied were the frontomaxillary, frontozygomatic, zygomaticomaxillary, zygomaticotemporal and premaxillomaxillary.

#### MATERIAL

The *Macaca rhesus* monkey was selected because it was the only readily available animal closely related to man. Although the anatomic details were not identical to those of the human being, it was felt that important information could be obtained in regard to normal growth of the face that would prove to be of value in the fields of dentistry, orthodontics, surgery, anthropology, and related sciences.

Eight monkeys (five males and three females) ranging in age from approximately 8 months to 2 years (Table I) were obtained from the Frank Buck farms in Florida. Since all animals were born in freedom, it was necessary to rely on the dentition to ascertain their approximate ages. These animals were divided into three groups on the basis of age. The youngest group, consisting of four animals, had a complete deciduous dentition and was estimated to be approximately 8 months of age. The intermediate group of two monkeys had the four permanent first molars and was estimated to be 18 months of age, while the oldest group of two animals was believed to be approximately 24 months of age because of the presence of the permanent central and lateral incisors as well as the permanent first molars. The experimental period ranged from seven to ten months (Table I).

#### METHODS

*Anesthesia.*—The animals were anesthetized with an intraperitoneal injection of a 3 per cent solution of sodium pentobarbital ( $\frac{1}{2}$  c.c. per pound body weight) in order to insert the metallic implants and to take cephalometric roentgenograms.

*Metallic Implants (Direct Measurements).*—A surgical approach was developed to implant amalgam in the bone on each side of the following sutures: frontozygomatic, frontomaxillary, zygomaticomaxillary, zygomaticotemporal,

and premaxillomaxillary (Fig. 1). A sterile technique was utilized throughout the operative procedure. After securing the animals to the operating table, the left side of the head and face was shaved. The surgical field was painted with 3 per cent tincture of iodine, followed by 70 per cent alcohol and isolated with sterile towels.

The incisions were planned so as to avoid the facial nerve. Interference with the motor nerve supply to the facial musculature would disturb function and therefore affect the experiment.

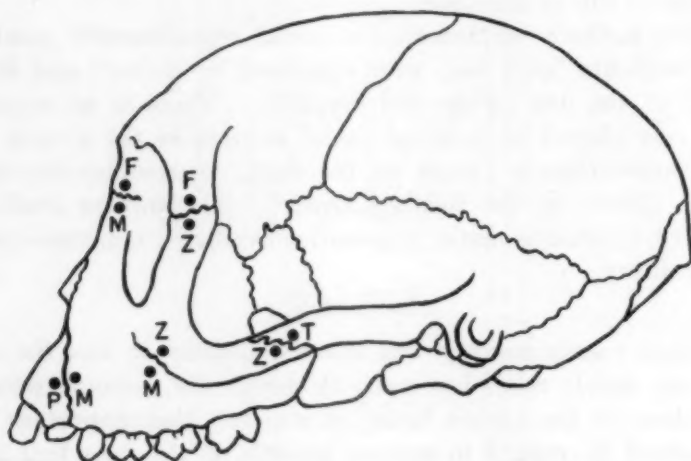


Fig. 1.—Diagram of lateral view of monkey skull showing facial sutures studied. Amalgam which was implanted on each side of the sutures is shown as a large black dot. *F*, frontal bone; *M*, maxilla; *Z*, zygoma; *T*, temporal bone; *P*, premaxilla.

The zygomaticotemporal and frontozygomatic sutures were exposed by overlying, horizontal, extraoral incisions. The frontomaxillary suture was exposed by a midline, vertical, extraoral incision. The zygomaticomaxillary and premaxillomaxillary sutures were exposed intraorally by incisions which followed the plane of these sutures. When the periosteum was reached, it was incised and elevated to expose the bone. A number 35 inverted cone dental bur, mounted in a dental handpiece, was used to prepare cavities in bones adjacent to the selected suture lines. Amalgam was packed into the prepared cavities because of its radioopacity, pliability, and tolerance by tissues.<sup>12</sup> An indentation was made in the center of each implant with the point of a caliper and the distance between each pair of implants recorded. The soft tissue was then replaced and sutured with 000 black silk.

In three of the animals some difficulty was encountered in locating the sutures. In a few instances, examination of the first postoperative roentgenograms revealed the implants to be on the same side of the suture. In others, serial roentgenograms revealed no separation of the paired implants. These sutures were then surgically re-exposed, and with the roentgenograms as a guide additional amalgam implants were inserted at the desired position.

The trauma at the time of surgical operation and insertion of implants may have influenced sutural growth. All sites of implantation were exposed

in a similar manner. Inasmuch as the same procedure was used at all times, the effects should be similar. The purpose of this investigation was to determine trends rather than the exact amounts of growth at individual sutures.

*Cephalometric Roentgenograms and Tracings (Indirect Measurements).—*During the course of the experiment, cephalometric roentgenograms were taken on the Broadbent-Bolton cephalometer at monthly intervals (Fig. 2, A). The animals were oriented in the Frankfort horizontal plane. An ear post was placed in each external auditory meatus with the lower border of the left orbit touching the orbital marker (Fig. 2, B). The exposure time was one second for the lateral films and one and one-half seconds for the frontal films at 20 Ma. and 68 KVP. The distance between the centers of each pair of implants was recorded directly from the roentgenograms (Fig. 3, A).

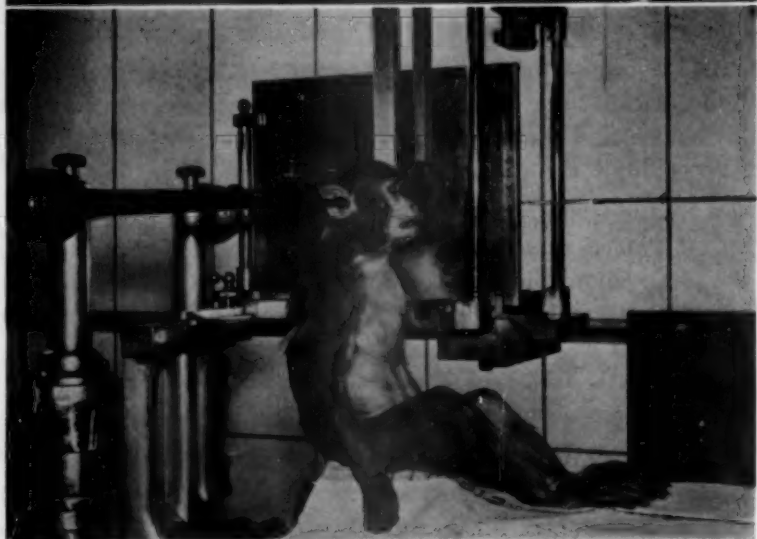
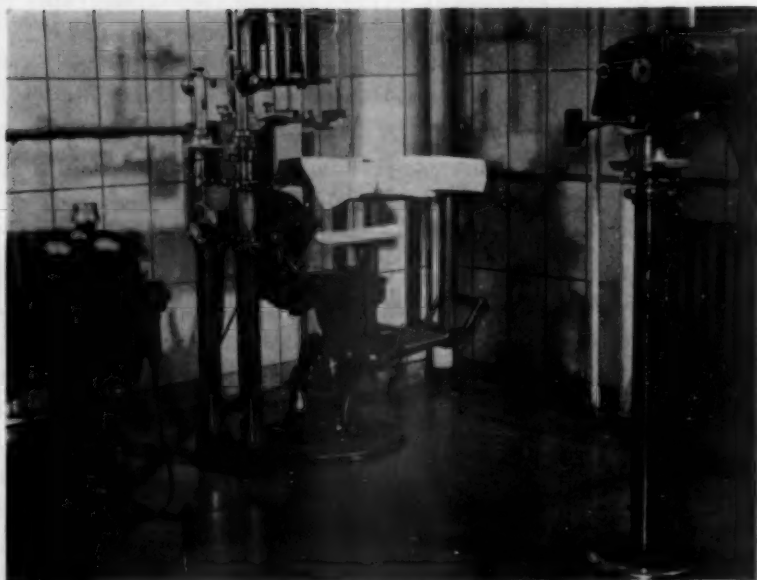
In order to have comparable serial roentgenograms, the position of the head in the cephalometer must be constant. An attempt was made to position the heads as accurately as possible. The orbital landmark, however, was palpated through the skin. Some variation, therefore, was introduced in the vertical position of the head. This was of no consequence in the lateral roentgenograms. Regardless of the vertical orientation of the head, as long as the ear posts are in the external auditory meati the lateral films are comparable. In a few instances lateral roentgenograms were taken on animals which were not positioned properly in the cephalometer. These were discarded and a new set of roentgenograms was taken. Because of the variability in the frontal films, serial lateral roentgenograms were used for superpositioning.

Individual tracings were made of the serial roentgenograms for each animal. Tracings of the original and final roentgenograms were superposed on the outlines of sella turcica and the most superior portion of the anterior cranial fossa defined by the roofs of the orbits (Fig. 9, A, B, and C).

Variation in the distance of the implants from the film and the variation in angulation of paired implants to the central ray of the x-ray tube were at least two factors responsible for some distortion. A minimum of distortion occurs with implants lying in a plane perpendicular to the central ray of the x-ray tube. Implants placed in the frontomaxillary, frontozygomatic, and zygomaticotemporal sutures fall into this category. However, implants placed in the area of the zygomaticomaxillary and premaxillomaxillary sutures lie in a plane oblique to the central ray of the tube and consequently show distortion. This error is avoided in measurements taken directly on the skulls.

*Preparation of Material.*—The animals were sacrificed by means of a lethal intraperitoneal dose of sodium pentobarbital seven to ten months after the onset of the experiment. The heads were then severed and the soft tissues dissected. Selected skulls were bleached in a solution of albion C (30 per cent  $H_2O_2$ ) (Fig. 3, B). One skull was cleared by placing it in 70 per cent alcohol for two days, in 95 per cent alcohol for one week, and in absolute alcohol for one week. It was then placed in a solution of methyl salicylate. This method makes the bone translucent and permits excellent visualization of implants (Fig. 3, C).

A.



B.

Fig. 2.—Cephalometry. A, The Broadbent-Bolton cephalometer adapted for use on the monkey. B, Anesthetized *Macaca rhesus* monkey in position for taking lateral and frontal cephalometric roentgenograms. Cassette in position for lateral roentgenogram.

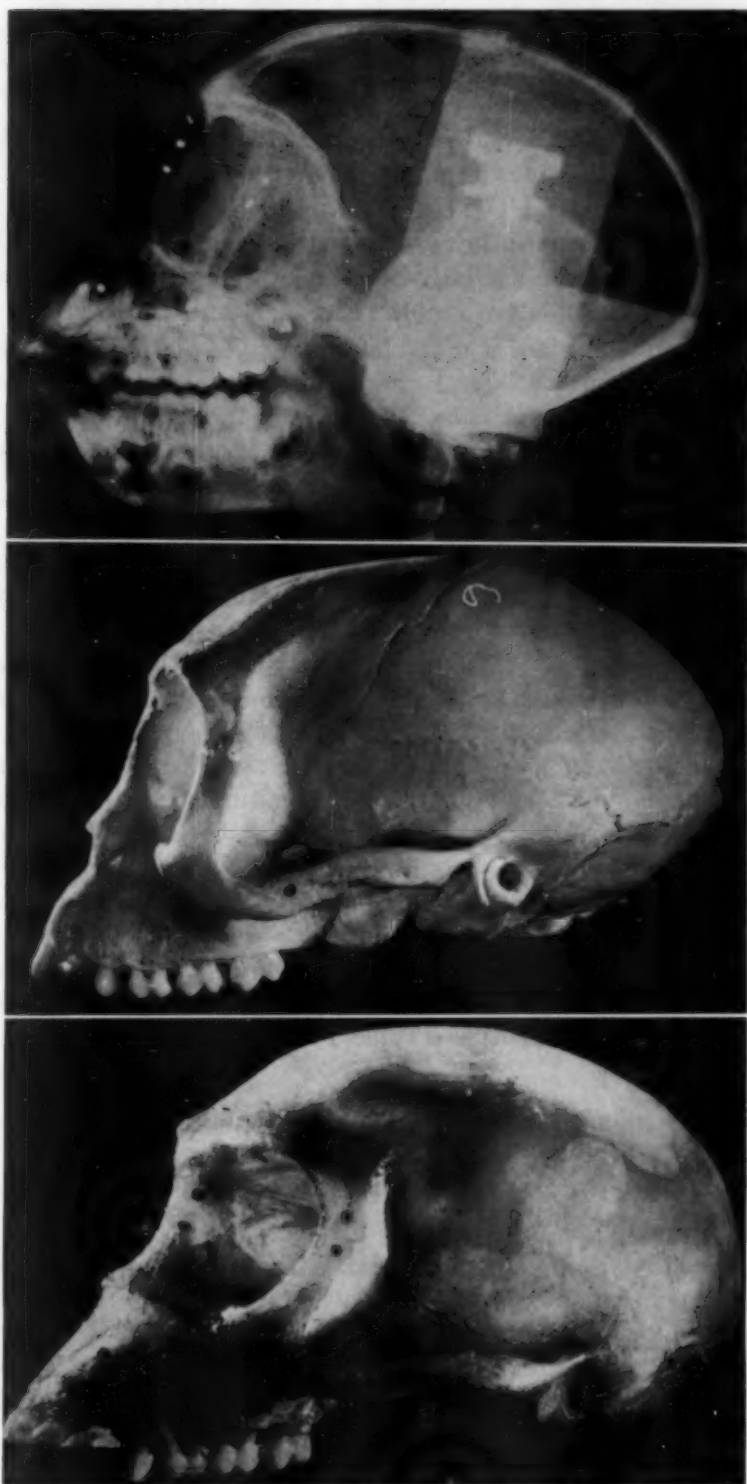


Fig. 3.—Gross and roentgenographic demonstrations of metallic implants at selected suture areas. *A*, Lateral cephalometric roentgenogram of animal No. 23. Note visibility of all implants. Compare with *B* and *C*. (See Fig. 1.) *B*, Bleached skull of animal No. 21. Note visibility of implant in the temporal process of the zygomatic bone. Other implants are not as readily visible. *C*, Cleared skull of animal No. 23. Implant on the temporal side of the zygomaticotemporal suture is invisible because it has been covered by a thick layer of bone. Note retention of implants. Compare increased visibility of the implants with those in *B*.

## FINDINGS

*Examination of Skulls.—*

*Tissue reaction to individual implants:* Of the 80 implants inserted 7 were lost and 73 remained firmly within the facial skeleton. Evidence of infection was seen in only one animal. The thin plates of bone were resorbed and some metallic implants were found lying free in the connective tissue. Fifty-nine implants were found to be partially or completely covered by a thin plate of bone, while 14 were completely visible (Fig. 3, B and C).

Amalgam implants placed on the lateral surface of the frontal bone could no longer be seen from the lateral view. They were now visible only on the medial surface of the frontal bone which forms the lateral wall of the orbit. Pegs placed at the zygomaticotemporal suture on the lateral surface of the zygomatic process of the temporal bone were similarly visible only from the medial surface of the zygomatic arch.

*Separation of paired implants:* Measurements of the distance between sutural implants taken on the skulls revealed that separation of implants at the zygomaticotemporal suture exceeded all other areas studied. Next in amount of separation were the implants in the area of the zygomaticomaxillary suture. Separation of paired implants at the frontozygomatic, frontomaxillary, and premaxillomaxillary sutures was considerably less. Variations in the increased distance between paired implants were noted. In several animals the separation of implants at the frontomaxillary suture exceeded that of the premaxillomaxillary suture. In others the reverse was true. This lack of consistency, as well as the small amount of increase in the separation of paired sutural implants at the frontomaxillary, frontozygomatic, and premaxillomaxillary sutures, made it difficult to place these areas in a definite order. In the two older groups of animals the implants were separated to a lesser degree than was observed in the younger group, the only exception being the implants at the premaxillomaxillary suture (Table I).

*Examination of Roentgenograms.—*

*Individual implants:* Analysis of serial frontal roentgenograms revealed that the implants originally placed on the lateral surfaces of the zygomatic processes of the temporal and frontal bones were now closer to the medial surfaces.

*Paired implants:* Measurements taken on the roentgenograms followed closely those taken on the specimens (Table I). Implants at the zygomaticotemporal suture showed the greatest amount of separation. Implants at the zygomaticomaxillary suture were next. The small amount of separation of implants in the other three areas precluded their placement in a definite order.

*Rate of separation:* In all three age groups studied, the rate of separation of implants in the zygomaticotemporal suture exceeded all other areas. In the youngest group of animals the rate of separation of implants in the zygomaticotemporal and zygomaticomaxillary sutures exceeded that of the other two groups (Figs. 4 and 5). In the middle group the rate of separation at the

frontomaxillary and frontozygomatic sutures exceeded that of the other two groups (Figs. 6 and 7), while in the oldest group the rate of separation of the implants in the premaxillomaxillary sutures exceeded that of the other two groups (Fig. 8).

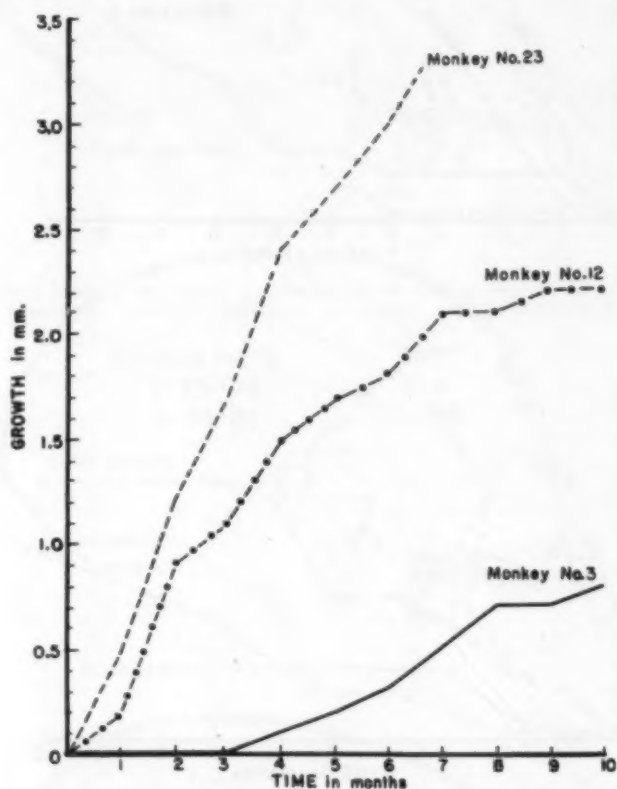


Fig. 4.—The approximate rate of growth at the zygomaticotemporal suture as determined from cephalometric roentgenograms of monkeys Nos. 23, 12 and 3. Animal No. 23 is representative of the youngest group (8-15 mo.), No. 12 of the middle group (18-28 mo.), and No. 3 of the oldest group (24-34 mo.). Note that this area shows the greatest rate of growth. Compare with Figs. 5, 6, 7, and 8.

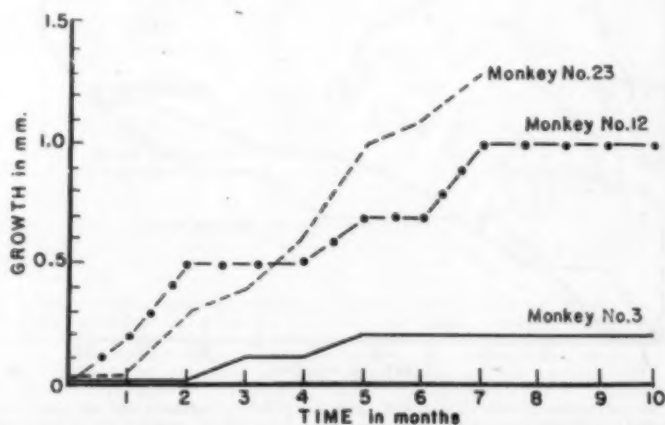


Fig. 5.—The rate of growth at the zygomaticomaxillary suture in monkeys Nos. 23, 12, and 3. Note that the rate of growth at this suture is less than that in the zygomaticotemporal. Compare with Fig. 4, 6, 7, and 8.

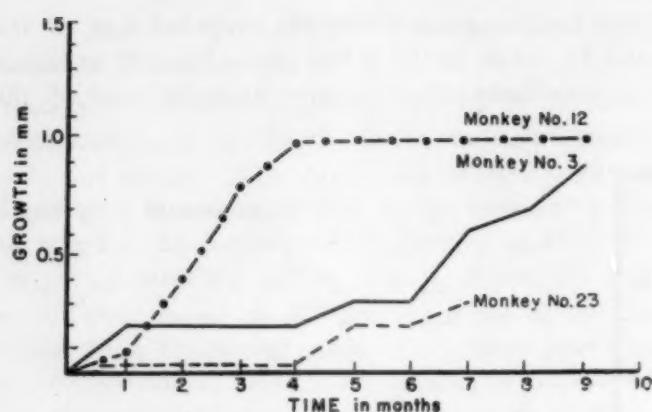


Fig. 6.—The rate of growth at the frontomaxillary suture in monkeys Nos. 23, 12, and 3. Note that the rate of growth at this suture is relatively inactive. Compare with Figs. 4, 5, 7, and 8.

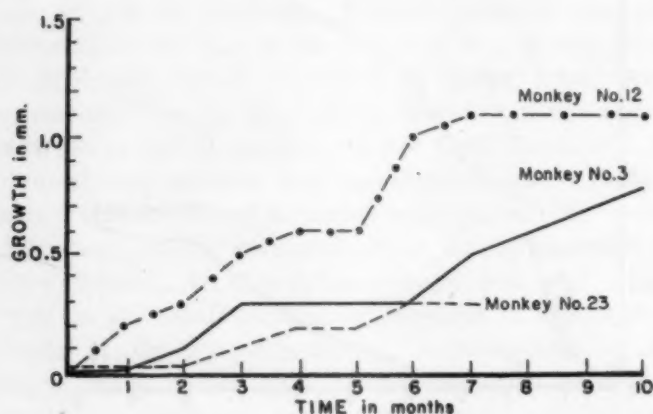


Fig. 7.—The rate of growth at the frontozygomatic suture in monkeys Nos. 23, 12, and 3. Note that the rate of growth at this suture is relatively inactive. Compare with Figs. 4, 5, 6, and 8.

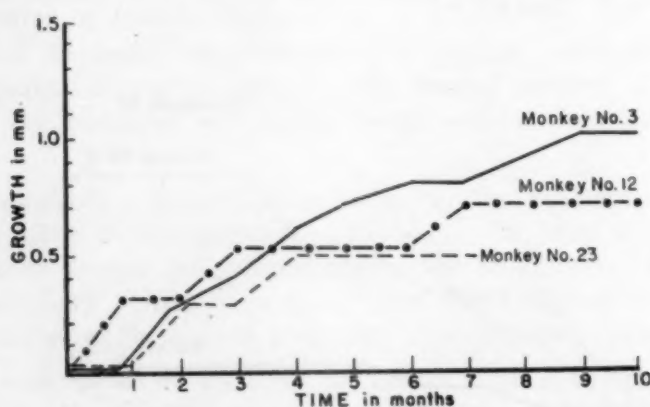


Fig. 8.—The rate of growth at the premaxillomaxillary suture in monkeys Nos. 23, 12, and 3. Note that at this suture the rate of growth is relatively inactive. Compare with Figs. 4, 5, 6, and 7.

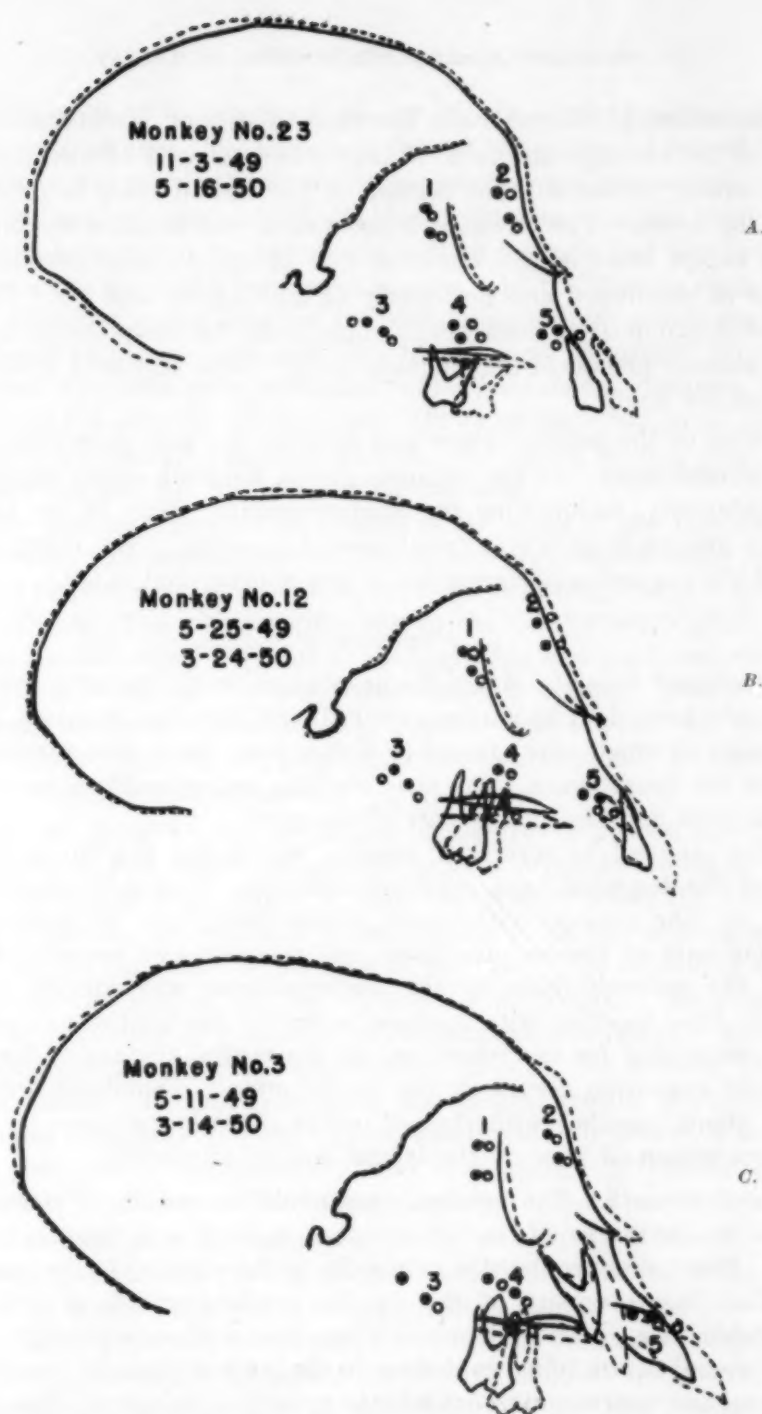


Fig. 9.—Superposed tracings demonstrating movement of implants with total growth of the face. 1, Frontozygomatic suture; 2, frontomaxillary suture; 3, zygomaticotemporal suture; 4, zygomaticomaxillary suture; 5, premaxillomaxillary suture. —, Tracing of original roentgenogram; ---, tracing of final roentgenogram; ○, position of implant at the beginning of the study; ●, position of implant at the completion of the study. A, Monkey representing youngest group. Note downward and forward movement of all implants with the exception of the one placed on the temporal side of the zygomaticotemporal suture, which moved downward and posteriorly. Also note stability of the facial pattern. Compare with B and C. B, Monkey representing middle-aged group. Note downward and forward movement of all implants with the exception of the one placed on the temporal side of the zygomaticotemporal suture which moved downward and posteriorly. Note tendency toward snouting. Compare with A and C. C, Monkey representing oldest group. Note downward and forward movement of all implants with the exception of the one placed on the temporal side of the zygomaticotemporal suture which remained stationary. Also note tendency toward "snouting" of the face. Compare with A and B.

*Examination of Superposed Tracings of Serial Roentgenograms.*—The tracings of the roentgenograms were superposed on sella turcica and the most superior outline of the anterior portion of the cranial fossa as defined by the roofs of the orbits. This revealed a downward and forward movement of all implants except those on the temporal side of the zygomaticotemporal suture which moved downward and posteriorly (Fig. 9, A, B, and C). The findings in the oldest group of animals were similar, with the exception of the implants in the zygomatic process of the temporal bone. These appeared to be stationary throughout the study.

Outlines of the occlusal plane and floor of the nose descended in a plane parallel to each other. In the youngest group, the bony profile of the face was shifted anteriorly, maintaining the original outline, while in the intermediate and older groups there was a trend toward snouting. The oldest group also exhibited the beginning of formation of the supraorbital ridge.

#### DISCUSSION

*Appositional Growth.*—Local tissue reaction to the metallic implants used in this study proved to be minimal. Of the 80 implants inserted, 73 were retained, many of which were covered by a thin bony plate, demonstrating surface growth of the facial bones. The most striking area of surface growth was the zygomatic arch and the lateral wall of the orbit.

Moore<sup>13</sup> showed by means of alizarin red S that the tip of the petrous portion of the temporal bone exhibited staining. This was interpreted to be a result of "the gradual withdrawal of this part from the interval between the basilar part of the occipital bone and the posterior margin of the great wing of the sphenoid bone as the temporal bone was carried laterally by growth." This, together with increase in size of the masticatory musculature, may be responsible for the resorption on the medial surface of the zygomatic arch, while apposition occurs on the lateral surface. Similarly, growth of the lacrimal gland, together with that of ocular musculature, may be responsible for the resorption of bone on the lateral wall of the orbit.

*Sutural Growth.*—The greatest amount of separation of paired implants occurred in the areas of the zygomaticotemporal and zygomaticomaxillary sutures. These areas contribute primarily to the anteroinferior growth of the face. That the tuberosity of the maxilla exhibits prolific growth against a rather stable base (pterygoid process) has been well established.<sup>22</sup> The zygomaticotemporal suture lying, as it does, in the general plane of junction between the visceral and neurocranium reflects the growth of this area. The zygomaticomaxillary suture, lying anteriorly but in a plane parallel to that of the craniofacial hafting zone, contributes to the downward and forward movement of the middle face.

The two sutures observed in this study which contribute most to the downward growth of the face are the frontomaxillary and frontozygomatic. Although growth was evident in these areas, it did not account for the entire vertical growth of the face. The floor of the nose was found to have descended to a

lower level than could be accounted for by growth of the frontomaxillary and frontozygomatic sutures. The same was true of the occlusal plane of the teeth. This difference was attributed to surface resorption and apposition.

The premaxillary segment of the facial skeleton was relatively inactive except during eruption of the permanent central incisors, and particularly just prior to the eruption of the permanent canines. In the *Macaca rhesus* monkey a natural diastema exists between the deciduous cuspid and lateral incisor. The permanent cuspid appears only after the adjacent permanent premolar and lateral incisor are already in occlusion. The pre-existent diastema is totally inadequate for the eruption of this tooth. Prior to the eruption of the permanent cuspid the premaxilla exhibits growth, establishing enough room not only for the tooth but also for the pre-existing diastema.

The rate and total amount of growth in the areas of the frontomaxillary, frontozygomatic, and premaxillomaxillary sutures were significantly lower than the rate and total amount of growth in the zygomaticotemporal and zygomaticomaxillary sutures. The greatest difference in the measurements of the distance between the paired sutural implants at the beginning and the termination of the experiment was found at the zygomaticotemporal suture. This was readily and relatively accurately measurable. This was less true of the zygomaticomaxillary suture. The frontozygomatic, frontomaxillary, and premaxillomaxillary sutures were relatively inactive.

*Total Facial Growth.*—The regularity of the growth process in maintaining the basic pattern with which ontogenetic growth proceeds should be stressed. The outlines of the occlusal planes of teeth, observed in either the deciduous or permanent dentition, descended in a plane parallel to the original one. The same was true for the plane of the floor of the nose. The outline of the facial profile was likewise shifted but not distorted with growth. The oldest group exhibited the beginning of formation of the supraorbital ridge. Although no two animals exhibited identical quantitative growth, the general pattern of growth was similar. This study suggests that sutural growth of the face varies in different age periods as follows: (1) the anteroposterior growth is most active in the age group from approximately 8 to 15 months; (2) vertical growth is most active in the age group from approximately 18 to 34 months.

*Comparison Between the Roentgenographic and Direct Methods of Measuring Growth.*—Harmonious growth of the craniofacial complex takes place in three planes of space. There is a vertical, lateral, and an anteroposterior component. Whether growth is measured on the skull or on serial roentgenograms, the true direction of this development is extremely difficult to observe, not only because the various sutures grow at different rates but also because of their position in space. It is likely that with growth the position of the sutural planes to each other is changed. Growth of the face, therefore, does not follow straight lines, but with the rotation of the sutural planes, the bones of the face follow various curves. Measurements of this growth, taken either on the skull or on the roentgenograms, show only the linear enlargement. Although this study concerns itself with the growth of the face, it is fully realized that an inseparable coordination exists in the growth of the face and the skull as a whole.

The advantage of the direct method of measuring growth is that it gives accurate information about total growth, while the advantage of the roentgenographic method is that it permits the study of the rate and relative direction of growth. Because they complement each other, the two methods for studying bone growth were combined.

#### SUMMARY AND CONCLUSIONS

1. This report is based on eight growing *Macaca rhesus* monkeys in which 80 metallic implants were used to study growth of the frontomaxillary, frontozygomatic, zygomaticotemporal, zygomaticomaxillary, and premaxillomaxillary sutures. The experimental period varied from seven to ten months.

2. Direct measurements between each pair of implants were made at the time of placement and upon completion of the study.

3. Frontal and lateral serial cephalometric roentgenograms were taken at monthly intervals on the Broadbent-Bolton cephalometer. The distance between the centers of paired implants was recorded to show the rate of growth at each suture.

4. Tracings of the lateral roentgenograms were superposed on sella turcica and the superior outline of the orbits to study the change in position of the implants with growth.

5. *Examination of the Skulls.*—a. The greatest increase in the distance between the paired sutural implants was seen at the zygomaticotemporal suture. This was readily and relatively accurately measurable. This was less true of the zygomaticomaxillary suture. The frontomaxillary, frontozygomatic, and premaxillomaxillary sutures were relatively inactive.

b. Appositional growth was most prominent on the zygomatic arch and zygomatic process of the frontal bone. In these areas implants placed from the lateral side were now visible only from the medial side.

c. Only the total amount of growth could be determined from direct measurements.

6. *Examination of Roentgenograms.*—a. Sutural growth of the facial bones varied in different age periods as follows: The anteroposterior growth was most active in the age group from approximately 8 to 15 months; vertical growth was most active in the age group from approximately 18 to 34 months.

b. The rate of separation of paired implants was greatest at the zygomaticotemporal suture.

c. Roentgenographic studies gave information not only about total growth but also about the rate of growth.

d. The roentgenographic method of measuring growth was not entirely accurate because of: (1) difficulties in the proper positioning of the animals in relation to the x-ray tube, (2) variation in the distance of the implants from the film, and (3) variation in angulation of paired implants to the central ray of the x-ray tube.

7. *Examination of Tracings.*—a. All metallic implants moved in a downward and anterior direction except those in the temporal side of the zygomatic arch which moved downward and posteriorly. In the oldest animal this implant remained stationary.

b. Outlines of the occlusal plane and floor of the nose descended in a plane parallel to each other. In the youngest group the bony profile of the face was shifted anteriorly, maintaining the original outline, while in the intermediate and older groups there was a trend toward "snouting." The oldest animal exhibited the beginning of formation of the supraorbital ridge.

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# AN ANALYSIS OF THE CLINICAL ENTITY, MAXILLARY PROTRUSION, WITH RELATION TO CLASSIFICATION, DIAGNOSIS, AND TREATMENT

KARL E. VON DER HEYDT, D.D.S., M.S.D., OAK PARK, ILL.

"It is indeed regrettable that 'extraction' in orthodontics has come to mean the removal of four first premolars."—*Hayes N. Nance.*

## I. INTRODUCTION

AMONG the clinical entities most commonly seen by the practicing orthodontist is the ubiquitous maxillary protrusion. This concomitance of seemingly every Class II, Division 1 condition is noted in the examination. During treatment efforts to reduce the protrusion are employed. Often, however, treatment is unduly prolonged and failure to reduce the mesiodistal relation is charged to many factors, such as the failure to cooperate, heredity, collapse of anchorage, and other orthodontic nonentities. It is becoming increasingly evident, however, that failure is due to inaccurate diagnosis and the resultant mistreatment. Therefore, it behooves us to examine minutely that loose category known as Class II, Division 1 (Angle) and to separate it into its proper divisions in the light of modern research.

## II. REVIEW OF LITERATURE

Being concerned with dental relationships only, the Angle classification tended to overlook (in spite of many efforts to include these facial relations) those broader craniofacial considerations which are so characteristic of modern diagnostic methods. The Angle classification is so well entrenched into orthodontic thinking that the mesiodistal locking of the first molars is an old beacon we are too likely to follow despite the fact that our course is now plotted with new instruments, new concepts, and better understanding. Because of its simplicity, this classification does not convey the same idea to everyone. In the seventh edition Dr. Angle said: "These classes are based on the mesiodistal relation of the teeth, the dental arches, and the jaws, which depend primarily upon the positions mesiodistally assumed by first permanent molars on their eruption and locking." The implications which have been drawn from this and other related statements made by Dr. Angle are innumerable and the abuses which he and his contemporaries heaped upon one another are a reflection of the narrow-mindedness of the times in which they lived. The weakness in Dr. Angle's teachings is that the interpretations leave a great deal to the individual judgment and experience of the investigator and the selection of the first molars as a landmark for diagnosis leaves a great deal to be desired.

Careful reading of the work of Paul Simon indicates that he had a glimmering into the existence of more than one type of Class II, Division 1. His

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terminology and ponderous method of presentation confused the picture for us and the unreliability of the Law of the Canine has led to the general abandonment of the Simon system of diagnosis.

Because Dr. Charles Tweed was convinced that he had developed a superior system of anchorage, he overlooked the existence of a true maxillary protrusion. His preoccupation with anchorage preparation and uprighting of the lower incisors stirred much controversy and discussion in orthodontic circles. The success that he had in treating (without recognizing) the true maxillary protrusion is probably due to the fact that it is safer to overextract than to risk anchorage collapse and relapse without compromise. The work of Tweed reduced the importance of the first molars as landmarks for diagnosis and introduced the lower incisor and the facial profile. Dr. J. A. Salzmann, however, published an article in which he showed that the procumbency of the lower incisors should not be overemphasized in the decision to compromise, and some of his findings are most interesting.

Disappointment in the results of orthodontic treatment after extraction of four premolars has been widespread, and if more lasting results are to be expected, with or without extraction, more weight will have to be given more elusive factors than that of tooth positions alone. Dr. Salzmann believes that we must consider not only the dentofacial complex but also be aware of the psychosomatic involvements which are frequently responsible for abnormal postural relations of the jaws which lead to aberrant stresses on the dentition and allow recurrence of the malocclusion. Facial prognathism has been the prime etiologic factor in determining the desirability of extraction as an adjunct to orthodontic treatment. It is Dr. Salzmann's opinion, however, that this prognathism cannot be attributed to the axial inclination of the incisor teeth alone. He believes that the facial profile is affected by the size and shape of the jaws, the dentoalveolar protrusion, the axial inclination of the incisor teeth, the size of the gonial angle, the relation of the mandibular dental arch to the prementon point, and the distribution and amount of the soft subcutaneous tissue covering the face.

Two of Dr. Salzmann's most interesting figures are reproduced here and they show most graphically a lack of coordination between the protrusive profile and the forward tipping of the lower incisor teeth (Fig. 1).

A summary of the factors of the dentofacial complex which must be considered as criteria for extraction in individual patients is as follows:

1. The labiolingual dental arch relationship to prementon point.
2. The size of the gonial angle.
3. The axial inclination and the relationship of the mandibular incisors to the plane which passes through the prementon point and is perpendicular to the mandibular plane.
4. The type and degree of irregularity and crowding present in the dental arches before orthodontic treatment is undertaken.
5. The presence of constriction of the basal arches in relation to the dental arches.
6. The relative difference in the size of the basal arches.
7. The amount and distribution of the soft tissue covering the facial bones.

Much of the discussion of Class II, Division 1 malocclusion centers on the results of treatment obtained in which the lower incisors are moved "off" or "forward" of the basal bone or ridge to produce an unstable "bimaxillary protrusion." Time and trouble could be saved by a recognition of a Class II tooth relation in which the lower arch is more nearly normal in relation to cranial anatomy than the upper, yet the lower cannot be expected to offer sufficient anchorage for the correction of the mesiodistal relation except the price of an unsatisfactory tooth to bony base relation. The existence of a condition such as this is the premise upon which this article is founded.

The difficulty of recognizing what we will call a "maxillary protrusion" is the major cause of the confusion which it has produced. There are, according to Bjork, three main causes of maxillary overbite. These are shown in Fig. 2 and are explained by him as follows:

- A. A relative difference in basal prognathism.
- B. A relative difference in alveolar prognathism.
- C. Inclination of incisors.

It is sufficient to say that treatment of these three conditions would require different approaches and we will discuss this problem later.

It is also Bjork's opinion that "prognathic facial builds" may arise in the following ways:

- A. Due to a shortening of the cranial base.
- B. Due to angular bending of the cranial base.
- C. Due to changes in the shape of the facial skeleton which cause the angle formed between the ramus and the cranial base to diminish.
- D. Due to increased jaw length.

On the whole, these conditions are combined in different ways which tend to cancel them out individually, or produce an equal prognathism in both jaws, a condition which he designated as "total prognathism." Bjork found, however, certain cases in which the maxillary prognathism is greater than that of the mandibular, and the converse. These conditions are accompanied by corresponding changes in the occlusion, and the difference between maxillary and mandibular prognathism is due to a variation of the size of the jaws and a variation in the length of the cranial base which joins the two jaws. A most interesting observation which Dr. Bjork made is that the correlation between maxillary and mandibular prognathism diminishes as a result of racial mixtures. To conclude this reference let us quote directly as follows:

Distal occlusion is therefore considered to be associated partially with a protruding upper jaw, partially with a recession of the lower jaw and partially with a combination of both.

In an examination of 740 children with Class II malocclusion, Young, Johnson, Smyth, and Still found a similar condition and we quote them as follows:

. . . Boys with class II occlusion (are) characterized by an enlargement of the facial length measurement of the upper jaw, compared with the corresponding normal group. There is no difference in the lower jaw.

The results obtained from the girls were different with only one age group showing an increased maxillary length, with the remainder showing a mandibular retrusion in Class II. Again we are faced with more than one type of Class II.

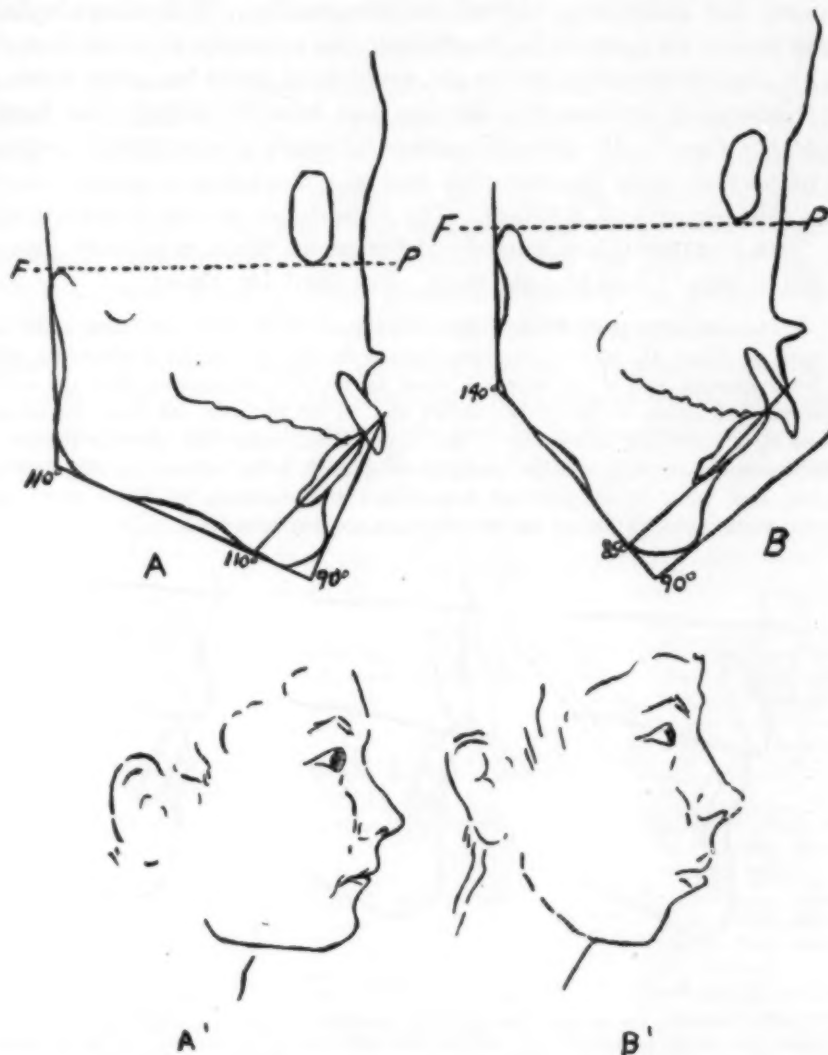


Fig. 1.—Outline drawings of profile roentgenograms, oriented along the Frankfort plane. *A*, has a gonion angle of  $110^\circ$  and a procumbency of the mandibular incisors to the mandibular plane of  $110^\circ$ . The incisor teeth are close to the prementon plane which is tangent to the prementon point, indicating that the entire dental arch is situated in a comparatively forward position in relation to the base of the mandible. *B*, has a gonion angle of  $140^\circ$  and the mandibular teeth are at  $85^\circ$  in relation to the mandibular plane. The mandibular incisors are comparatively more distal to the prementon plane which is tangent to the prementon point, indicating that the entire dental arch is situated in comparatively more distal relationship of the mandibular incisors to the base of the mandible in each of the foregoing patients; the angular relationship of the incisors to the Frankfort plane is actually the same in both patients. The effect of the procumbency of the mandibular incisors in *A* is offset by the comparative acuteness of the gonion angle which is  $110^\circ$ , while in *B*, the effect of the retrusion of the mandibular incisors is nullified by the comparative obtuseness of the gonion angle,  $140^\circ$ . (Courtesy, Salzmann, J. A.: *AM. J. ORTHODONTICS* 35: 584, 1949.)

*A'* and *B'* are profile tracings of photographs of *A* and *B*, showing differences in facial outlines and in the degree of prognathism due mostly to differences in length of the mandibular ramus and the acuteness of the respective gonion angles. Incisor procumbency is not a factor in prognathism of the facial profile in these patients.

Calvin Case, in his text *Dental Orthopedia*, naïvely thought he had all the problems of orthodontics solved. His diagnosis was not for an academic purpose, for with the establishing of a malocclusion within one of his classifications it was only necessary to turn to the back of the book to find which "apparatus" was designed to correct the abnormality. It is most emphatically not the purpose of this article to re-establish this approach to orthodontic thinking, but his classification relative to the problem at hand has some value. Case saw the relationship between the denture and what he called "the immovable features of the face." He noted instances in which the maxillary denture was forward of normal while the mandible was in a more nearly normal relation to the immovable features of the face. The importance of this observation lay in the fact that treatment was entirely different in these maxillary protrusions than it was in other Class II conditions. For, said Dr. Case:

*Protrusion of Upper With Lower Normal.*—I shall first call your attention to types of Class II, which are characterized by decided upper protrusions with the lower normal, and which demand, from an esthetic standpoint, that the entire movement calculated to properly correct the facial outlines can only be accomplished by a retruding movement of the upper labial teeth and alveolar process, a movement which usually can be easily accomplished after extracting the first bicuspid, and what is of greatest importance the positions of lower teeth and original malinterdigitation of the buccal cusps are not disturbed.

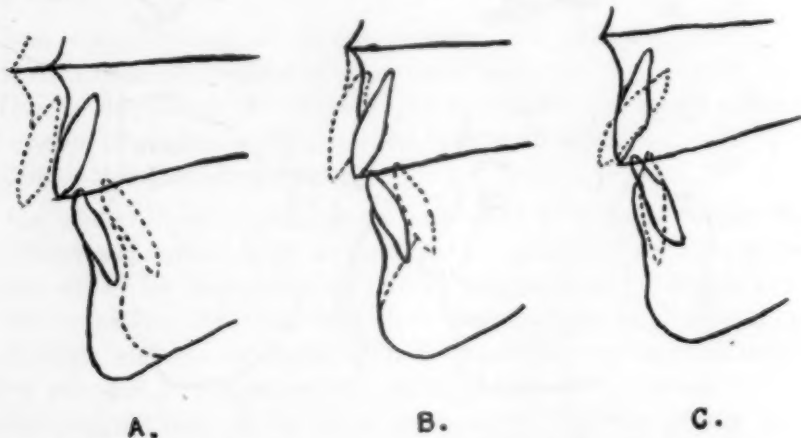


Fig. 2.—The three main causes of maxillary overbite as described by Bjork are: A, Relative difference in basal prognathism; B, relative difference in alveolar prognathism; C, inclination of incisors. Solid lines represent the normal, while the dotted lines represent the abnormal condition.

The important observations made by Case were overshadowed for thirty years by the strong light of Dr. Angle's influence, only to emerge as a basic concept of modern practice. He recommended the extraction of two upper premolars in what was called "Type B Class II." This condition was characterized by poor closure with good mastication while the upper buccal teeth occlude one premolar width mesial to normal.

A discussion of the general effects of extraction of four premolars in treating maxillary protrusion admits that mandibular anchorage cannot be successfully established without the removal of lower teeth except under unusual con-

ditions. The loss of lower teeth is not only extravagant but complicates the treatment plan considerably as it then becomes necessary to reposition the teeth in both dental arches. The room gained by the extraction in the lower arch makes it possible to wear intermaxillary elastics which cause the lower posterior segment to move anteriorly more rapidly than the upper, with the net result that the Class II molar relation is eliminated. Correction of the molar relation before extraction has been most unsatisfactory. Mandibular anchorage, prepared or otherwise, which has been overtaxed by intermaxillary traction allows the evolution of a complicated bimaxillary protrusion once the tooth relation is corrected. Removal of four premolars at this stage has, unfortunately, been experienced by most of us, and I, for one, have had considerable difficulty keeping the molar relation correctly established during the closure of the premolar spaces. It appears, therefore, that planned overextraction would be safer than risking anchorage collapse to be corrected by future compromise.

Class II, Division 1 (Angle) has been divided into several component parts by Dr. Bercu Fischer, and he has accepted a condition in which the upper dental arch is mesial to normal while the lower arch is in a position more nearly ideal than the upper. In Table I the differential criteria for diagnosis is set forth.

TABLE I. CLASS II, DIVISION 1, SUMMARY OF DIAGNOSIS

<i>Differential Criteria</i>			
DENTOFACIAL RELATIONSHIP	FACIAL DIVERGENCE	FACIAL	DENTAL
Maxillary protrusion	Forward or backward	Protrusion of upper lip or fullness around the mouth	Protruding maxillary incisors; great variation in incisor-mandibular plane angle— <i>Overjet</i> marked to extreme.
Bimaxillary protrusion	Forward or backward	Fullness around the mouth always present	<i>Overjet</i> slight.
Mandibular retrusion	Backward only	Chinless appearance	<i>Overjet</i> varies from slight to extreme; <i>Overbite</i> usually slight.
1. Structural 2. Functional	Backward only	Chinless appearance	<i>Overjet</i> varies from slight to extreme; <i>Overbite</i> varies from marked to extreme.
Retrusion of mandibular dental arch	Forward only	Good chin; lower lip against incisal edges of upper front teeth. Deepened labiomental depression.	Pronounced retrusion of lower denture with the upper normal.

### III. MAXILLARY PROTRUSION

The characteristics of maxillary protrusion are those found in Class II, Division 1. The upper arch, however, is anterior to normal when related to cranium and is excessively prognathic. The mandible, suspended by its musculature, is more nearly normal in its anteroposterior position when related to cranial landmarks. The relative position of these two structures produces a Class II dental relationship with a firm malinterdigitation of the buccal teeth of one cusp width. There is a fullness around the mouth accentuated in the

STANDARD PROFILE DIAGRAM  
OF MALE STUDENTS CU.  
NORMAL OCCLUSION

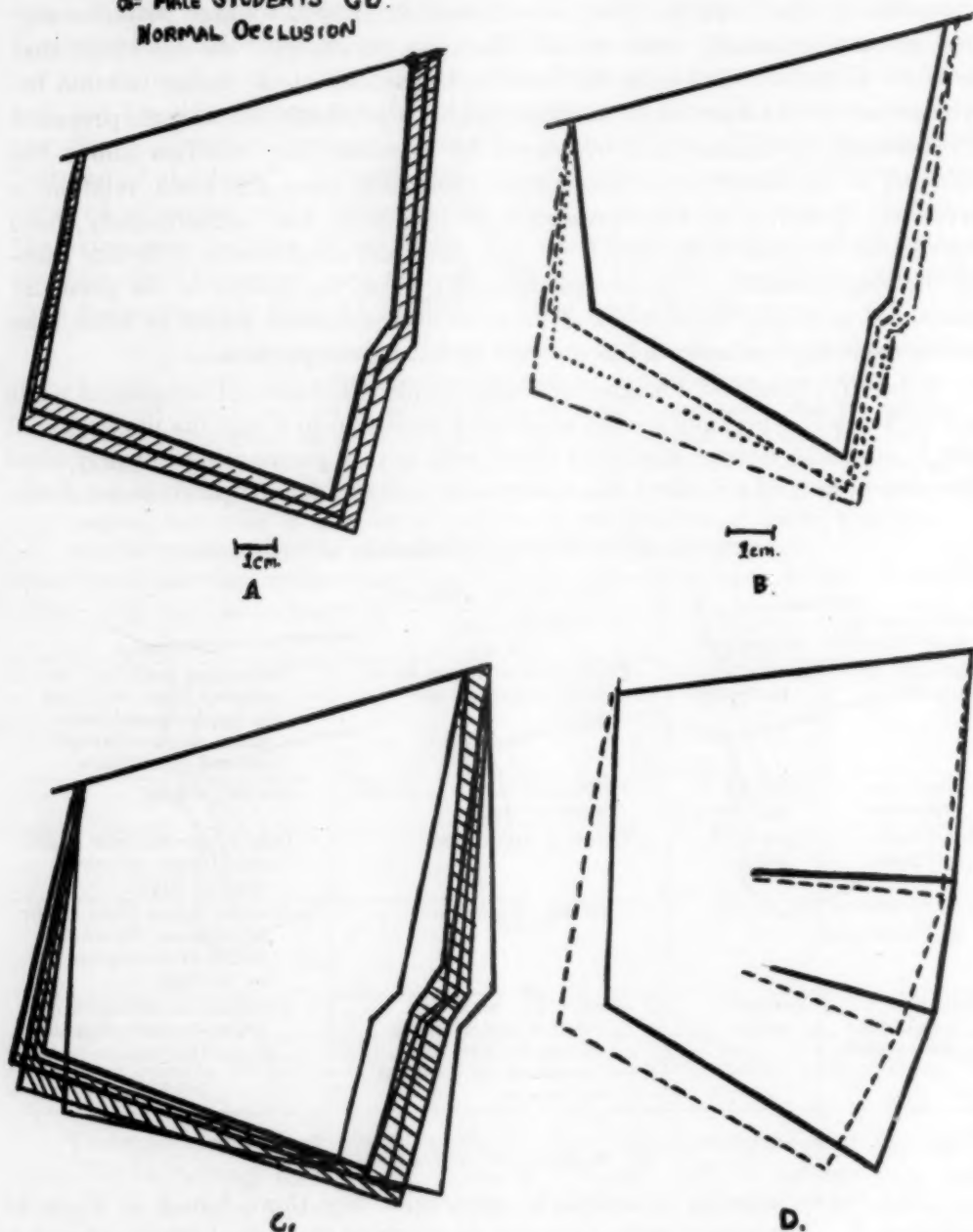


Fig. 3.—Facial profile diagram, dentition in normal occlusion. *A*, Standard from average; *B*, backward facial divergence; *C*, three facial profiles: One average, one forward, and one backward divergent. *D*, two facial profiles: one backward divergent and one forward divergent. (*A*, *B*, and *C*, from Milo Hellman; *D* from Allan Brodie; entire figure, from Fischer, Bereu: *Angle, Orthodontist* 20: 2, 1950.)



Fig. 4.—Three Class II facial profiles typical of true maxillary protrusion. (From Fischer, Bercu: *Angle Orthodontist* 20: 2, 1950.)



Fig. 5.—True maxillary protrusion treated by extraction of two upper first premolars and reduction of overjet, allowing molars to remain in Class II relation. No extraction in lower. Note profile improvement.

upper lip area, and a marked overjet is produced by the protruding upper incisors. The maxillary arch form is good. A deepened mental sulcus is found in the lower lip. The mandibular-incisor angle is not constant and the facial divergence may be either forward or backward.

The divergence of the face must be considered a function of the skeletal pattern, and a backward divergent face should not be considered abnormal nor a forward divergent face normal. It is, however, not feasible to attempt to change one type of face into another, as the structures involved are beyond the influence of the dental units amenable to orthodontic stimulation. There are all degrees of variation between the limits shown in the facial diagrams of Milo Hellman and Allan Brodie. (Figs. 3, 4, and 5.)

#### IV. DIFFERENTIATION OF CLASS II

The differentiation of Class II, Division 1 (Angle) into its component parts is somewhat difficult as there are many conditions which obscure clear-cut lines of demarcation and consequently have allowed the true maxillary protrusion to be generally overlooked and become really a stepchild of orthodontics.

Confusion of the maxillary protrusion with the mandibular displacement has been very common. The displacement cases have come into rather critical focus through the work of Dr. John R. Thompson. The most common diagnostic feature of this condition is the existence of a dental interference forcing a shift of the jaw from a "Class I" position when at rest, out of occlusion, into a "Class II" relation when in occlusion. To find this profile which is good until the teeth are actually in occlusion is occasionally difficult and examination of the static set of models and profile photographs or radiographs is not sufficient, as this is a dynamic condition in which only the worn facets of the offending cusps of teeth offer a static clue to the interference. An excessive overbite accentuates the "hit and slide" feature of this condition. Elimination of the cuspal interference allows a dramatic and quick correction of these malocclusions.

The *vogelgesicht* or bird face of the German is a most descriptive designation for the structural mandibular retrusion. This condition is characterized by a chinless appearance and a backward divergent face with an excessive overbite and overjet. Maxillary crowding varies with the degree of natural compensation. Separation of this condition from a mandibular displacement is vital as treatment of the two conditions must not be interchanged.

Maleruption of the cuspids is so common that Calvin Case designated "Class I" under his system to this condition. "High cuspid" cases in which the molars are in Class II relation are in reality maxillary protrusions. However, the teeth that are blocked out of the arch have allowed a natural compensation which has eliminated many of the features of the protrusion, especially the poor profiles and the protruding incisors. If these teeth were to be brought into the arch then a true maxillary protrusion would result; consequently, we have chosen to term such a condition a *potential maxillary protrusion*. This broadens the scope of the classification to include teeth other than cuspids which are blocked out of the arch, for there are also premolars and

upper anterior teeth which may be out of position in a manner identical to that of the "high cuspids." Treatment of a potential maxillary protrusion is basically identical to that of a maxillary protrusion except that often nature has helped in closing the spaces before treatment was instigated.



Fig. 6.—Class II malocclusion in which the lower arch was sufficiently well developed and teeth spaced to allow its use as anchorage for reduction of mesiodistal relationship to normal. Subsequent growth and development has allowed the third molars to erupt and become functional.

There are Class II conditions in which anchorage can be prepared without extraction and in which there is adequate mandibular bulk to allow the reduction of the mesiodistal relation to "normal" (Fig. 6). Such a condition is termed a *retruded mandibular dental arch*. This is not to be confused with a retruded mandible in which the size, contour, and position of the mandible are posterior in relation to the cranium. Retrusion of the mandibular arch refers to the anteroposterior position of the dental arch alone and does not involve the body of the mandible. This explains the presence of a good chin but allows the lower lip to rest against the incisal edge of the upper front teeth and produces an exaggeration of the mental depression. Spacing of the lower teeth would lessen these diagnostic characteristics but would increase the possibility of anchorage preparation without sacrificing dental units, and such a condition would still fall in the category of a retruded dental arch.

Borderline conditions have always been the bugaboo of the diagnostician. Recognition of these cases is something that is developed over years of practice and these lines should become narrowed with experience and improved diagnostic methods. When, however, a condition which is "between" is found, quite often it should then be considered an entity in itself. It is such a condition we have termed a "maxillary protrusion with mandibular insufficiency." The molar relation tends in a "Class II direction" yet the degree of protrusion of the maxilla under these conditions is not sufficient to produce either a "bad" profile or an extreme overjet of the upper incisors, despite the fact that these conditions are present. The mandible and lower teeth may be within normal limits although they would be called "delicate" in most cases, or mild crowding of the teeth may be present. The lower arch cannot be expected to offer anchorage for correction of the mesiodistal relation without compromise. Such compromise should be a matter for individual attention and judgment and should be "tailor made" for each case. (Fig. 8.)

Bimaxillary protrusion is, by definition, a condition in which the molar relation is somewhere near "normal" though anterior to "ideal." Such a condition must be classified as Class I, and though it is commonly discussed under the heading of Class II we will not consider it as such in this article.

#### V. DIAGNOSIS AND TREATMENT OF MAXILLARY PROTRUSION

A tendency remains in our present-day thinking in which a standardization of methods seems to be our goal. It may very well be that "preparation of anchorage" and the uprighting of the lower incisors as an infallible and positive necessity is as unbending an approach today as the preservation of a full complement of teeth has been in the past. Much of the confusion in the extraction versus the nonextraction school has, in my opinion, been the outgrowth of an inflexibility of approach in which anchorage preparation has been prescribed for conditions where it was not necessary, but rather the habit of the operator.

That "extraction" in orthodontics has come to mean the removal of four first premolars has been pointed out by H. N. Nance and this is a most unfortunate stigma. "Compromise" has come to have a similar meaning; however, we would propose the substitution of this word (compromise) for "extraction" without implying that an arbitrary group of teeth have been removed or even that teeth were lost during treatment. "Compromise" to us means only that less than "ideal" or "normal" has been planned or accomplished. Orthodontically this may mean that four first premolars have been removed, that fewer or other teeth have been sacrificed, that overlapping of some teeth has been allowed, or, finally, that indefinite retention has been planned.

Compromise procedures, particularly of the modified extraction category, should be considered and planned in the treatment of maxillary protrusion. The degree of compromise necessary should be left to the operator. A typical suggestion is presented in Fig. 5 which shows a case in which two upper first premolars have been removed.

The condition of *maxillary protrusion* is characterized by a Class II dental relationship in which the upper arch protrudes. The upper lip also protrudes

and there is a fullness around the mouth; there is a marked to extreme overjet with protruding maxillary incisors; the incisor-mandibular angle varies; and the facial divergence may be either forward or backward. The mandible has assumed a position which has been dictated by the musculature and it is in harmony with the facial pattern of the individual.

The risk of producing a "dished out" profile is somewhat lessened by using a modified extraction program rather than a full four premolar plan in which the molar relation is corrected, when treating a true maxillary protrusion. The facial improvement is most satisfactory and the interdigitation of the cuspids and reduction of the prominence of the upper anterior teeth can equal the perfection to which the operator is accustomed. The means by which the spaces in the upper teeth are closed is a matter of individual preference and it can be quite easily accomplished. Generally, banding of the three teeth posterior to the extraction site in the maxillary arch with sectional arches is sufficient anchorage, but headcaps and occipital force may be used if necessary. The method of moving the cuspids and incisors distally is not important, as long as the teeth are not too badly rotated and the anchorage will resist the force exerted upon it.

*A mixed maxillary protrusion with mandibular insufficiency* is a borderline condition in which the upper protrusion is usually rather mild while the lower arch will be "delicate" if not crowded, or if crowded, not severely so. The Class II dental relation is typically not clear-cut while the profile is poor but not bad. No attempt will be made to give all the possibilities that might be considered in compromising a case of this type, but we will offer a few possibilities. Extraction in the maxilla will be most commonly two first premolars, although second molars and second premolars, particularly when not in good repair, should be considered. The degree of crowding and/or the anchorage requirements will be the deciding factors in the lower arch with the decision between first and second premolars and possibly the removal of one lower incisor indicated. The use of occipital force will also temper the decision.

It is here we have lumped all the borderline cases, the ones we are not sure fit into any category and the orthodontic "headaches" in Class II. With the exception of this group, treatment can be done by rote, in a mechanical routine way. But here we must throw away the book and become orthodontists who sail by "dead reckoning," and it is here that compromise procedures out of the ordinary are to be undertaken. No two of us will agree on just what should be done with these cases, and if we are smart they are not the ones we will choose to show at table clinics, present as case reports or at other gatherings, because each in his own mind believed that something different could have been undertaken. It is the purpose of this article to break away from the usual, the accepted, and the agreed philosophies and to try to point out that everything does not fit into a groove which leads to an orthodontic utopia. There is no way to eliminate borderline cases. More scientific methods, more accurate records, and more orthodontic judgment will never eliminate, but will merely recognize them, and what will be done with and for these conditions will always be a matter for individual judgment. (Fig. 7.)

We have introduced a term to designate what would be typically called a "high cuspid case." When teeth such as cuspids, premolars, or other teeth are blocked out of the upper arch and a Class II dental relation is present it then becomes a "*potential maxillary protrusion*." (Fig. 8.) The profiles are generally good in this condition and will not be altered appreciably through treatment. It is possible to treat these high cuspids very easily by the removal of the upper first premolars. Placing an upper lingual arch may be advisable before the extraction of the premolars, although appliance therapy may not be necessary in selected cases and the so-called treatment by extraction or "auto-genesis" may be employed. "Finishing touches" are almost always necessary for these malocclusions, so some sort of appliance therapy is usually indicated.



Fig. 7.—Maxillary protrusion with mandibular insufficiency treated by extraction of two upper first premolars and one lower central incisor.

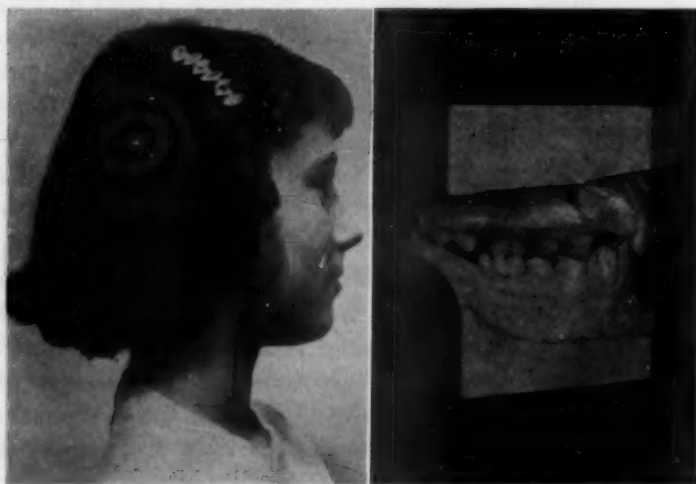


Fig. 8.—Potential maxillary protrusion with "high" cuspids.

The age of the patient is the most important factor in the choice of a plan of treatment for this condition. Treatment of potential maxillary protrusions other than high cuspids is also facilitated by modified extraction procedures.

It is not within the scope of this article to discuss the diagnosis or treatment of a structural mandibular retrusion, but the condition is so nearly parallel with the one under discussion that we are digressing momentarily to suggest

that overextraction is not nearly so dangerous in a true maxillary protrusion as it is in a structural mandibular retrusion, because in this latter condition the lack of bulk in the mandible is exaggerated through the loss of tooth substance. Finished results under these conditions—four premolars extracted in a structural mandibular retrusion—give a most unsatisfactory effect with the upper incisors tipped lingually as compensation. No method of treatment we have ever undertaken for structural mandibular retrusion has produced a profile which could be considered "classic" in nature.

TABLE II. COMPROMISE TREATMENT

EXTRACTION PROCEDURES SHOULD NOT BE INITIATED IN THE FOLLOWING:	
CLASS II MALOCCLUSION	CHARACTERISTICS
Mandibular displacement	Dental interference forces lower jaw distally when closing from "rest" to centric position; profile shows exaggerated mental depression when teeth are in contact; this improves when mouth is at rest; overbite is excessive; displacement is a dynamic condition with inconclusive static symptoms
Retruded mandibular dental arch	Spaced lower teeth or lingually tipped incisors; good chin with deep mental sulcus; anchorage can be prepared without extraction
MODIFIED EXTRACTION PROCEDURES SHOULD BE CONSIDERED FOR:	
Maxillary protrusion	Protruded upper lip with fullness around the mouth; excessive overjet produced by protrusion of upper incisors; maxillary arch form good; good chin; exaggerated mental sulcus; forward or backward divergent face
Maxillary protrusion with mandibular insufficiency	Borderline between maxillary protrusion and bimaxillary protrusion; Class II molar relation not clear-cut; "delicate" mandible or mildly crowded lower arch; poor but not bad profile
Potential maxillary protrusion	High cuspid or other blocked-out upper teeth; adequate lower arch; good profile
Structural mandibular retrusion	Chinless profile; overbite excessive; backward divergent face; overjet varies with degree of natural compensation
FULL EXTRACTION PROCEDURES ARE RESERVED FOR:	
CLASS I MOLAR RELATION	CHARACTERISTICS
Bimaxillary protrusion	Protrusive face with fullness around mouth; forward divergent profile; inadequate alveolar support for teeth present; upper and lower incisors tipped labially
Potential bimaxillary protrusion	Crowded arches; inadequate bony support for teeth present; forward divergent face; fair profile

Admitting that the profile and face will be improved but not "ideal" when only two upper first premolars are removed, we believe that this should become the method of choice. The improvement in the dental relation is quite satisfactory. Closure of the spaces can be done any way the operator chooses, with care being taken not to place any forward stress upon the lower arch or jaw.

#### VI. COMPROMISE TREATMENT

It is my considered opinion that a compromise treatment with modified extraction should be initiated in many cases, especially those in which Class II dental relations are encountered. This does not mean that there are not many

conditions in which it is advisable to remove four first premolars, that the practice of anchorage preparation should be discontinued, or that there are not many conditions in which "distal occlusions" are correctable without extraction. We do feel, however, that the modification of existing procedures should be considered and routinization of thinking should be minimized.

The characteristics of cases for which a modified extraction procedure should be explored have been summarized in Table II.

#### VII. CONCLUSIONS

1. The conventional classification of Class II, Division 1 (Angle) has been shown to be a composite consisting of many clinical entities.
2. True maxillary protrusion has been defined and differentiated from other conditions with which it has been confused in the past.
3. Methods of treatment of true maxillary protrusion and other related conditions have been suggested.
4. The newer approach to classification of maxillary protrusion indicates the existence of at least four distinct types:
  - a. True maxillary protrusion.
  - b. Maxillary protrusion with mandibular insufficiency.
  - c. Potential maxillary protrusion.
  - d. Mandibular displacements.
5. The importance of proper differentiation of these conditions in relation to treatment has been emphasized.

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715 LAKE ST.

## ORTHODONTIC ANCHORAGE

WALTER COOPER SANDUSKY, JR., D.D.S., MEMPHIS, TENN.

"GIVE me a place to stand and rest my lever on and I can move the earth." These words spoken by Archimedes<sup>6</sup> (287-212 B.C.), the great Greek mathematician and writer on science and mechanics, present the same problem, on a vastly greater scale, that the orthodontist faces today. This is the problem of adequate anchorage.

As Archimedes recognized the enormous and efficient power of the lever, so the orthodontist recognizes the enormous and efficient power he has in the modern orthodontic appliance. As Archimedes was limited in his use of the lever by the limitation of available anchorage, so the orthodontist is often limited in the use of his appliance by the insufficiency of his anchorage.

Calvin Case<sup>5</sup> stated that the most important of the laws of force in the mechanical movement of malposed teeth is Newton's third law: "To every action there is an equal and contrary reaction." Whatever the magnitude of force that is exerted toward a tooth may be, in order to move that tooth an equal amount of force must be exerted in an opposite direction upon the tooth or teeth that are to serve as resistance forces or units. We understand then that the relative amount of movement of the desired tooth is proportional to the respective resistances.

Strang<sup>17</sup> tells us that the teeth, which are the units of anchorage within the mouth, are held in position by tissue that is not necessarily designed to act as orthodontic anchorage by holding the teeth in a rigid position, but rather is designed to resist a certain amount of pull and coincidentally to absorb and prevent shock and trauma.

Webster's *Collegiate Dictionary* defines anchorage as "A secure hold for a heavy pull." Is there a secure hold in tissue which Strang says will "resorb and prevent shock and trauma?"

The answer to this perplexing problem may be found if we, as orthodontists, seek to acquaint ourselves thoroughly with all forms of resistance both intraorally and extraorally and learn how best to establish and maintain these forces of resistance to meet our individual needs as they arise during orthodontic treatment.

I think it well at this point to look back a few centuries to the early dentists and see how a few of them coped with the problem of tooth movement and how their early developments help us secure our goal of a stable anchorage.

Weinberger,<sup>19</sup> in his book, *Orthodontics: An Historical Review of Its Origin and Evolution*, stated that the first important appliance that marks a distinct

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step in our specialty was given us by Pierre Fauchard in 1723. The chief function of this appliance was to expand the arch. It has been known as a band, bow, bandelette, and short and long band, but in reality it was the early form of the expansion arch as we know it today.

The band, as the arch was called, was made of silver or gold in the shape of an ideal arch and was applied either to the labial or lingual of the arch according to the direction of tooth movement desired. Two holes were made at each end of the arch through which a thread was passed in order to attach the arch to those teeth of which movement was not desired. The use of this thread or ligature constitutes the first form of anchorage mentioned in the literature.

Delabarre,<sup>20</sup> according to Weinberger, devised the first wire crib which was later to prove very useful as an anchorage. He also described for the first time the "metallic box" or orthodontic band as we now term it.

William Imrie,<sup>21</sup> in his article "Parents' Dental Guide," described several new principles in orthodontic practice. One was the use of plaster models in conjunction with block tin for the construction of a bite plane; another, caps or bands soldered to the band (arch) for anchorage replacing ligatures formerly used for this purpose.

One of the earliest accounts we have of the slipping of anchorage units, Weinberger<sup>22</sup> tells us, was reported by Kniesel in 1836. He condemned the method of rotating teeth as was formerly recommended by Geraudly, Hunter, Brunner, and others because of a lack of anchorage. He stated, "An adjoining tooth or several of them must serve as a fulcrum, for the tooth. By this means the pressure of the ligature is divided evenly in an entire circle, then, according to the laws of the mechanics, the tooth that serves as a fulcrum is pushed just as much out of its position as the distorted tooth."

Kniesel reported this clinical experience because it seemed important to him that other men who were attempting to move teeth orthodontically might become mindful of the fact that the unwarranted selection of resistance units would only mean failure to obtain the results desired.

Clinical experience continued to be a good teacher and gradually from these early appliances began to evolve the efficient orthodontic mechanisms we know today. With each step in this evolution orthodontists seemed to become more and more mindful of the fact that the teeth could not be considered as anchorage themselves, but were secured to a base which, though strong and unyielding, was capable of undergoing changes in form.<sup>17</sup>

Rohde<sup>15</sup> explained that the true significance of the use of teeth in anchorage is that they furnish a method by which we may gain attachment to the underlying bone. Strang<sup>21</sup> stated that we have three tangible structures available for anchorage: the number and size of the tooth cusps, the number, form, and size of the tooth roots, and the periodontal membrane. The most influential structure available for anchorage is a variable structure, the supporting bone of the alveolar process.

It becomes necessary then for the orthodontists to understand the characteristics of this substance which he must rely upon for success in treatment.

John Hunter<sup>16</sup> stated two basic concepts of bone growth:

1. Bone grows by deposition on its free surfaces and is kept in a state of functional balance by compensating resorptions on other surfaces.
2. Bone grows more rapidly in some areas than in others which accounts for the change in its proportions.

In 1892 Wolff<sup>16</sup> gave us his law which states, "Every change in the form and function of a bone, or of its function alone, is followed by certain definite changes in its internal architecture, and equally definite secondary alterations in its external conformation in accordance with mathematical laws."

Rohde<sup>15</sup> explained that the interpretation which some men have made of this law is one of the reasons for the erroneous conception that in Class II, Division 1 (Angle) cases when the jaws are placed in normal position with normal interdigitation of the teeth, bone develops, thereby enlarging the mandible or "growing a chin." He stated further that the amount of bone in any individual mandible is genetically pre-determined, and only its structure can change.

Oppenheim,<sup>14</sup> in his classic work reported in 1911, climaxed the studies made upon the ability of bone to change and meet new demands. His experiments were conducted so that bone changes could be studied relative to orthodontic treatment.

He used monkeys upon which to conduct his experiments, employing the Angle expansion arch to produce tooth movement. He made microscopic slides from sections of tissues immediately surrounding the teeth which had been moved after the appliances had been active for forty, thirty-five, fifteen, and five days, respectively.

In studying these microscopic slides he found marked changes on the walls of the alveolus. Osteoclasts appeared on the pressure side with osteoblasts on the opposite side. There subsequently developed a cartilaginous bone which he termed osteoid tissue. Then appeared bony spicules or trabeculae which aligned themselves parallel to the line of stress on both the pressure and tension sides. On the side of tension proximate to the alveolar wall, osteoblasts had appeared and osteoclasts were present on the outer or remote surface of the alveolar bone. The architecture of the bone was now such that it was resisting orthodontic force.

He found that when slightly greater force was applied, further changes took place which allowed the tooth to move in the direction of force.

From this we may assume that it would be possible to maintain a minimal amount of force upon a tooth or teeth that are being used for anchorage and have the resistive quality of the bone maintain them in their original positions.

Following Oppenheim's works, Strang<sup>17</sup> formulated an important biologic principle in anchorage which he stated as follows:

The reaction from the force employed upon the teeth that are to be moved may be distributed in such a manner upon the various units of anchorage that its intensity will dictate such readjustments in the supporting bone as will build up resistance of those anchor teeth against displacement and avoid changes that are responsible for tooth movement.

With the presentation of Oppenheim's findings and their subsequent interpretation and application as Strang has done in the preceding quotation, there

came to the orthodontic profession the realization that there can be no true intraoral anchorage, at least as defined in Webster's dictionary, "A secure hold for a heavy pull." Rather we have to recognize the ever-present "biologic factor" when thinking in terms of intraoral anchorage. We have no other method by which we may gauge the optimal force that may be applied to a group of teeth serving as resistance units that will establish their stability. To gain proper anchorage we must rely upon clinical experience, coupling with it the knowledge of what takes place when we apply force to a tooth in a given direction.

I think McCoy's<sup>11</sup> definition of anchorage should be stated here for it does not picture intraoral anchorage as omnipotent, nor its application capable of producing all desired tooth movement, but relies upon the orthodontist's judgment to select proper anchorage for the tooth movement which he may wish to accomplish. He stated, "Anchorage consists in the selection of adequate and properly distributed resistance units for the control and direction of force applied to the teeth for arch development or for lesser tooth movements."

Having discussed the history and the source of anchorage, I now wish to consider the manner in which it is used. It is beyond the realm of this article to discuss fully the method or methods of attaining anchorage in each of the orthodontic techniques which hold popularity in this country. Since we are all more or less familiar with these techniques, phases of them will be discussed for convenience of illustration.

Most writers divide anchorage into two types: intraoral anchorage and extraoral anchorage. Intraoral anchorage, as we have previously stated, utilizes the teeth as resistance units. Extraoral anchorage, as its name implies, gains anchorage from structures outside the oral cavity, i.e., the occipital region, the cervical region, or, in rare instances, the face.

In Dewey and Anderson's textbook, *Practical Orthodontics*, the following complete classification appears:

#### OUTLINE OF ANCHORAGE

Intramaxillary	{	Simple	{ Single, or primary Compound or reinforced
		Stationary	{ Single, or primary Compound or reinforced
		Reciprocal	{ Simple primary Simple compound Stationary primary Stationary compound
Intermaxillary	{	Simple	{ Single, or primary Compound or reinforced
		Stationary	Compound
		Reciprocal	{ Simple primary Simple compound Stationary compound
Extramaxillary			{ Occipital or cranial Facial Cervical

Dewey and Anderson defined intramaxillary anchorage as "that form by which the resistance necessary to overcome the force required to move the malposed tooth or teeth is obtained within the same arch."

Simple anchorage, Angle<sup>2</sup> related, was the first and, until recent years, the only form employed in orthodontics. Strang<sup>17</sup> tells us that it refers to the use of an attachment upon the anchor tooth or teeth that will permit the anchor tooth or teeth to tip if a force strong enough to overcome their resistance is used against them. When a tooth tips it is only necessary for the alveolar bone surrounding the occlusal one-third of the root to modify to any great extent. The alveolar bone surrounding the remainder of the root modifies very slightly. For this reason it is the weakest form of anchorage, yet it may be used very successfully if its limitations are understood and the force is applied correctly.

Simple anchorage is exemplified in the use of a horizontal buccal tube serving as attachment for a round labial arch wire. The round wire fitting into a round tube allows a tipping movement when used for molar expansion. The addition of a molar on the opposite side, bearing the same type of attachment, would make the simple anchorage reinforced or compound.

According to Strang,<sup>17</sup> stationary anchorage is incorrectly designated since it is not stationary in the true sense of the word. It refers to the application of attachments upon the teeth selected for resistance that will prevent any movement of these teeth except bodily movement.

Angle<sup>2</sup> stated that this form of anchorage must be credited to Barrett who first used it, though his usage was not entirely efficient. He used a vulcanite plate entirely covering the molars and the vault of the palate. Of course this did not completely serve as a rigid attachment. Angle claimed to have introduced this form of anchorage for the first time in its perfect form.

Stationary anchorage is exemplified in the edgewise mechanism which Angle developed as a successor to the pin and tube appliance and the ribbon arch. Both of the latter appliances also employ stationary anchorage. In the edgewise mechanism a rectangular rigid wire passes through a rectangular sheath on the molar tooth. With this appliance in place the molar can move only in a bodily direction. When additional teeth are banded and the edgewise arch ligated in brackets secured to these bands we have reinforced or compound stationary anchorage.

Another example of stationary anchorage is the use of the lingual arch wire soldered to molar bands which, in turn, are cemented to the two first molars. Mershon,<sup>12</sup> by developing the half-round shaft attachment in 1915, gave us a removable lingual arch which is compounded stationary intramaxillary anchorage.

An excellent technique of obtaining stationary anchorage has been developed in the use of the "stabilizing plate" described by Moyers and Higley.<sup>13</sup> Its similarity to Barrett's original vulcanite plate described by Angle<sup>2</sup> both in form and principle is interesting. It is described as an acrylic resin device similar in design to the Hawley retainer. It is fashioned to fit around the lingual surfaces of all the teeth in the arch and covers as much of the mucosa as is feasible. In the plastic base of the appliance are cured half-round or round tubes which fit into attachments secured to molar bands.

It links all the teeth of the arch together as a unit, and in resting upon the mucosa, takes advantage of this fibrous tissue plus its underlying bone coupled with the dental resistance of the entire arch for anchorage.

Many applications of this stabilizing plate may be and have been made. It has been used as an adjunct to many varied types of orthodontic mechanisms. Weber<sup>18</sup> suggested a modification of its construction. He recommended the use of a lingual arch wire with Mershon-type attachments on the molar bands. In the maxillary arch the lingual arch wire does not contact the lingual of the anterior teeth in the conventional manner, but dips across the palate just posterior to the rugae from canine to canine. With the molar bands cemented in place, the lingual arch is inserted and acrylic resin of the self-curing variety is adapted over the rugae area and lingual portion of the anterior teeth, enveloping that portion of the arch wire. When the acrylic has set, the arch wire with the acrylic piece is removed and the piece or "button" trimmed and polished.

This appliance has proved useful both in the maxillary and the mandibular arches as a means of augmenting anchorage. It is frequently used as an adjunct to the Johnson twin wire appliance. Regarding reciprocal anchorage, Strang<sup>17</sup> stated that this is the form most universally employed. He believes it is not real anchorage from the viewpoint of fixation, but rather is equalized, controlled, and balanced tooth movement obtained by reciprocal movement of various teeth or groups of teeth.

A commonly noted example of this type of anchorage is that in which two central incisors are spaced and a rubber elastic or ligature is used to draw them together.

The Johnson twin wire appliance embodies mechanical principles that employ this type of anchorage very effectively. This is accomplished by the innate tendency of the twin wire to straighten itself once it has become distorted. An example of this may be cited in a case in which two maxillary central incisors are rotated. The twin wire is locked in the attachments located approximately in the center of the labial surface of each of these teeth, and immediately the tendency of the twin wire to straighten itself sets up a reciprocal force or anchorage between these two teeth.

Next we come to a consideration of intermaxillary anchorage. It is defined by Dewey and Anderson<sup>9</sup> as, "that form in which the resistance necessary to overcome the malposed tooth or teeth is derived from a tooth or teeth in the opposite arch."

This type of anchorage is obtained through the use of rubber elastics pitting a dental unit or dental units in the opposing arch against one another. It may be simple, stationary, or reciprocal, depending upon the type of resistance offered in the opposing arch.

Again I would like to remind the reader that the use of the term stationary anchorage is a misnomer in the true sense of the word. It implies that the anchorage would remain unchanged during the entire period of its employment. For a long time we have known that clinical evidence has proved this connotation of the term inaccurate.

Brodie, Goldstein, and Myer<sup>4</sup> in 1938 published the first cephalometric appraisal of a group of Class II, Division 1, (Angle) cases that were treated using intermaxillary elastics and employing Angle's method of obtaining station-

ary anchorage with edgewise mechanism in the mandibular arch. They reported that the mandibular arch yielded while the maxillary arch remained relatively stationary.

Many investigations of a similar nature have been conducted since that date, and we have come to the firm realization that what has been suspected by clinicians for many years is true: most intermaxillary forces are reciprocal in nature.

Viewing the work of these men and others and from his own clinical experience, Charles Tweed,<sup>17</sup> of Tucson, Ariz., employing the edgewise mechanism, developed a mechanical factor to combat this undesirable movement which is so often experienced with the use of Class II type elastics.

His is a prepared type of mandibular anchorage. Its principle is disputed by many who adhere more strictly to biological teachings, i.e., the root of a tooth that has been moved orthodontically is surrounded by osteoid tissue which yields readily to additional orthodontic pressure. Because of Tweed's positive clinical proof of the value of a prepared anchorage, however, he has certainly revolutionized much of the profession's concept of anchorage preparation. His technique is that of always placing the mandibular incisor teeth upright over basal bone, a procedure which often must be preceded by the extraction of selected teeth. Then he proceeds to tip the posterior teeth to distally inclined axial positions. With the arch thus prepared he feels that the axial position of each tooth is such that it is best able mechanically to resist the force that will eventually be used against it in producing the tooth movements required during treatment.

The "stabilizing plate" and its modifications, described previously in conjunction with intramaxillary anchorage, has proved very helpful in producing a more stable anchorage when employing intermaxillary force.

When a reciprocal type of intermaxillary anchorage is desired, as in those cases in which we may wish the mandibular teeth to move forward at the same time the maxillary teeth move distally, intermaxillary elastics may be employed without great regard for the mandibular anchorage. When we feel that the teeth in the arch used for anchorage are in correct positions and a slight forward shifting of them resulting from the use of intermaxillary type elastics would cause them to be tipped off the basal bone, then reciprocal movement is very dangerous.

As clinicians we must use our judgment in the selection and utilization of anchorage no matter what mechanism or technique we employ. Often it is found that no matter what principles we employ in securing proper anchorage, the desired tooth movement cannot be obtained with intraoral resistance units alone. The answer to such a problem can only be the use of extraoral anchorage.

Strang<sup>17</sup> is of the opinion that extraoral anchorage has been and is being overlooked by many operators in our field, even though it is truly stationary anchorage. Its importance to the orthodontist cannot be overestimated.

There have been and are varied ways of obtaining extraoral anchorage. The use of some type of headgear in conjunction with elastics which connect it to the intraoral appliance is called occipital anchorage. The use of a neck strap in the same capacity is called cervical anchorage, and the use of a gear on the face to facilitate forward movement of the teeth is called facial anchorage. Of the three, occipital anchorage enjoys the most popularity.

This anchorage may be used in various ways. Kniesel,<sup>23</sup> according to Weinberger, published his idea of occipital anchorage, the first in the literature, in 1836.

Others use it in conjunction with the chin cap modifying it. Later it was perfected as an anchorage by Angle.<sup>1</sup> He used it both to retrude protruding maxillary incisors and in conjunction with the chin cap to help reduce Class III type of malocclusions.

In the Tweed technique occipital anchorage is used to stabilize the maxillary denture while preparing the mandibular anchorage.<sup>17</sup> Kloehn<sup>10</sup> has been very successful in the use of occipital anchorage in the mixed dentition treatment of extreme Class II (Angle) cases by its use in conjunction with the Angle E arch. This allows the operator to treat the case without using the mandibular arch for anchorage, an excellent precaution at this developmental stage.

Weber<sup>18</sup> devised a technique with which he can attach the Johnson twin arch wire to the headcap constituting occipital anchorage. By employing this mechanism, the headcap can be worn at night and retrusion of incisor teeth, a step in the treatment of Class II, Division 1 (Angle) cases, can be accomplished without the use of mandibular anchorage.

Many more examples could be cited of the usefulness of extraoral anchorage, and still there remains much more to be developed concerning its use. Certainly all orthodontists should deeply investigate this useful form of stationary anchorage that is readily available.

#### CONCLUSIONS

1. There is no true form of stationary anchorage available intraorally.
2. The teeth alone do not constitute anchorage but serve as units by which we gain attachment through the periodontium to the underlying bone.
3. In choosing anchorage, the orthodontist should rely upon clinical experience coupled with the knowledge of what takes place in the surrounding tissue when force is transmitted to it from a tooth.
4. The orthodontist should avail himself of a type of orthodontic mechanism with which he can take most efficient advantage of the intraoral anchorage that is available.
5. In many cases intraoral anchorage can be supplemented by, or replaced by, extraoral anchorage to insure greater stability.

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### Erratum

The article by William G. Houghton entitled, "Rehabilitation of the Cleft Palate Patient," which appeared on page 611 of the August issue of the JOURNAL, should have contained the following footnote:

"This was a thesis submitted to the American Board of Orthodontics in partial fulfillment of the requirements for certification."

## ENDOCRINE PROBLEMS IN ORTHODONTICS

### THE CONCEPT OF A RELATIVE METABOLIC INSUFFICIENCY IN BONE DUE TO RAPID SKELETAL GROWTH AND SLOW SEXUAL MATURATION

B. N. TAGER, M.D., CLAREMONT, CALIF.

OVER one hundred children presenting special orthodontic difficulties in treatment were studied medically for evidences of endocrine and metabolic disease. The following defects aroused the orthodontist's suspicions of metabolic disturbances, motivating the medical study: delayed dentition, abnormal mobility or immobility in therapy, abnormal mandibular or maxillary bone structure as revealed by trabeculation, and root resorption.

Since all of these children were thoroughly investigated clinically and observed at intervals over variable periods of time from six months to six years, it may be of interest to present the medical findings. These, however, do not lend themselves to any clear-cut tabulation for many reasons: first, because of the difficulties of medical diagnosis in many cases, to be described later; second, because of the impossibility of evaluating any single disturbed laboratory finding as against the validity of the total clinical picture; third, because a statistical effort in so small a group, with so many variables, would be invalid. One is therefore limited to an expression of opinion on the basis of clinical experience, which will be elaborated in this text.

Because all the children were private practice patients and were economically in a position to subsidize orthodontic care as well as medical study, they obviously constituted a group of well-fed and cared for individuals, where any gross dietary deficiency or infections had been previously eliminated by their personal physicians. This, however, was not taken for granted in the present endeavor. A complete medical history and dietary inventory, as well as complete examination for systemic disease, was obtained in each instance, including, of course, such minimal essentials as a complete blood count, sedimentation rate, Kahn test, and urinalysis. Occasionally a secondary anemia, susceptibility to infection, or focal sepsis was found. A few children manifested abnormal eating habits, such as excessive carbohydrate preference or protein dislike. These findings were of no greater incident than in any other comparable group studied medically for other purposes, and may therefore be dismissed from conclusions in this series of economically and medically solvent individuals, previously canvassed by their dentists and doctors.

#### EXTENT OF METABOLIC STUDY

What then about the less apparent metabolic or endocrine findings? A clear understanding of the extent of clinical study and criteria of diagnosis is prerequisite for an adequate evaluation. The following biochemical and radio-

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graphic aids were utilized: the basal metabolic rate, serum cholesterol, protein-bound iodine, serum calcium and phosphorus, sugar tolerance, and radiograms of wrists and of the lateral skull. The results of these test procedures and interpretation may be summarized:

The basal metabolism is unreliable in children under 10 years of age for technical reasons. In children over 10, the normal basal metabolism varied from minus 20 to plus 15. Unfortunately, the standards for normalcy of plus 15 per cent to minus 20 per cent are wide enough to include a child standing still in his growth processes as well as one growing rapidly. Hence, the numerical value of the basal metabolic rating showed no correlation with physiological reality. A flexible scale wide enough to filter out variations of body build and technical problems of measuring oxygen consumption, yet fine enough to provide a sliding scale based on body demands in proportion to growth rate, is not available in medical science.

The serum calcium blood levels were entirely within their normal limits of 9 to 11 mg. per 100 c.c., eliminating parathyroid disease as a possibility. Similarly, serum inorganic phosphorus was also normal. Calcium balance studies involving intake and output were not undertaken. The qualitative urinary Sulkowitch test in a number of youngsters was normal, and in view of lack of any other established clinical manifestations, dental and otherwise, and the rather uncommon nature of the disease, the failure to demonstrate parathyroid abnormality in this small group should elicit no surprise. Similarly, other known osseous diseases that influence serum calcium and phosphorus changes, such as rickets, were ruled out.

The sugar tolerance tests (4-hour or 2½-hour type) were entirely normal, since no case of diabetes was present in the group observed. The considerable flexibility of the normal carbohydrate tolerance was as uninformative as the normal rigidity of serum calcium and phosphorus.

The serum protein-bound iodine was found to be low in most cases of hypothyroidism, although the depression may have been only a few micrograms below the normal range of 5 to 8  $\mu\text{g}$  per 100 c.c. of blood. A normal blood iodine, however, does not rule out hypothyroidism provided a high cholesterol and other pronounced clinical information is available. The serum cholesterol was the more sensitive indicator of thyroid deficiency, not only in the severe, but also, and especially, in the partial hypothyroid. A finding of 200  $\mu\text{g}$  or above per 100 c.c. in childhood is distinctly suggestive of hypothyroidism when other cholesteremic conditions are excluded. One must be cautioned here to be certain to establish his normal in values on the basis of many tests performed in the same laboratory, since the facile colorimetric method popularly employed may vary in results for a given patient by as much as 50  $\mu\text{g}$  from one laboratory to another, yet be very consistent when performed by the same worker in a given establishment.

The roentgenogram of the wrist is an index of osseous development, and consequently of the true skeletal maturity of the child, quite distinct from growth in height. Delay in bone development of two years or more, as compared with chronological age, is often, but not invariably, reflected in other

somatic retardations, such as linear growth, muscle mass, central nervous system maturity, mental and emotional age. The bone age is invariably retarded in comparison with chronological age in all cases manifesting hypothyroidism of several years' duration or longer. Yet there must always be kept in mind the fact that hypothyroidism is only one of the causes of delay in bone development. After the elimination of other causes of osseous retardation, other endocrine, nutritional, infectious, and systemic diseases, there still remains the largest group, in whom no disease is found. It may be safely stated that a vast majority of boys over 8 years of age revealing a frequently encountered delay in bone maturation of two years represent a slower pattern of unfolding on the basis of constitutional factors that often repeats itself in siblings; and this may be elicited in the parents' history as well. This constitutional type of delay is seen four times more frequently in boys than in girls, as contrasted with true hypothyroidism of childhood, which is seen more frequently in girls. Furthermore, these delays in bone development, when found after 10 years of age, presage a later pubertal onset, and are undoubtedly dependent on all the factors in the human being that regulate his sexual maturity.

Roentgenograms of the skull in the lateral position, and of the sella turcica, were within normal limits in all cases. The value of these studies has generally proved to be unrevealing for the diagnosis of pituitary function. Only in cases of erosion from tumors or calcification within the sella, do we acquire circumstantial evidence of pituitary abnormality. The small sella does not mean low pituitary secretion, nor does the closed sella. The large sella does not represent hypersecretion. The skull, however, at times does reveal osseous patterns deserving study by the orthodontist. The small sella and absent frontal sinus may be associated with crowded facial bony structures. Manifestations of unusual shapes or positions of the sella will often show other anomalies in the same skull and suggest congenital variants which can be expected orthodontically or elsewhere. The presence of some osteoporosis in the skull tables due to rapid growth in a youngster is frequently disputed by equally competent roentgenologists. The skull changes of parathyroid diseases were not encountered in this series.

#### RESULTS

*a. Endocrine disease:* Approximately 10 per cent of the children studied revealed a frank endocrinopathy. With the exception of one hypopituitary girl, all were hypothyroid, myxedemas, or cretins, or partially so. From the medical standpoint, they presented a full house of requirements for diagnosis on the basis of history, physical findings, and laboratory tests. From the orthodontic standpoint, the findings were those generally seen in association with thyroid deficiency, the most striking being delayed dentition and underdevelopment of the mandible. These children invariably made a good medical response to thyroid medication, although the dental stimulation frequently lagged behind other changes, especially in the older age group. The teeth presented a higher threshold of thyroid sensitivity as compared to other tissues. Dosage of 1 gr., or 1½ gr. daily, may be quite sufficient to produce ac-

celerated linear growth, skin changes, and mental improvement, yet be quite insufficient for dental effects, which become apparent when the medication is continued for longer periods or is pushed to 2 gr. daily. There appeared to exist a strong genetic factor in dental exfoliation in many cases, where a stubborn maintenance of the status quo persists long after other tissue response. It is to be remembered that concomitant congenital anomalies are frequent in true hypothyroids, with consequent refractoriness in response of some tissue in an otherwise thyroid-sensitive individual. The hypopituitary makes a very poor response to thyroid medication, both in dentition and mandibular growth, while pituitary growth hormones so far available on the market have been entirely ineffective.

*b. Congenital:* Approximately 20 per cent of the cases revealed congenital anomalies, which, of course, showed complete independence in their responses and unpredictability. Children may have retarded dentition yet fail to reveal retardation elsewhere. Conversely, many children with delayed osseous development, not on a hypothyroid basis, may fail to demonstrate any delay in dentition; and normal dentition has been found in cases of pubertas praecox in spite of advanced sexual and bone maturity. Congenital disturbances seen elsewhere in the body will reflect themselves at times in the oral cavity. Various asymmetries of the face, orbit, optic nerve size, length of extremities, and size of the chest, will show a marked constriction of the oral cavity on the same or counterlateral side, with delayed dentition and crowding. A case of Turner's syndrome, with typical under stature, webbing of the neck, demonstrated marked recession of the mandible, delayed dentition, and delayed bone development. The figure of 20 per cent for genetic disturbance is possibly too low for this series because the failure to prove its existence in many instances does not rule out an inherent metabolic defect in bone, on a hereditary basis, particularly if this is quantitative rather than qualitative.

*c. Rapid growth in height with slow sexual maturation:* The greatest proportion of cases revealed neither specific endocrine disease nor congenital anomalies. Since most of the children were between the ages of 9 and 15, some manifestations of puberty in the greatest number of them are not surprising. What did appear significant, however, was the evidence that certain types of orthodontic defects, namely, root absorption and architectural abnormalities of the mandibular or maxillary bone (scarce, porotic, or poorly patterned) repeated themselves in a particular type of accelerated growth pattern of puberty. These children were of good, or better than average, stature, and gave a history of better than adequate linear growth for the preceding years, concomitant with a slow, or inadequate, sexual change for their age. It would be improper to call these youngsters hypogonad, since they constitute a very common variant of pubertal patterns seen in childhood. Sexual maturation progresses variably to a striking degree, over an age span from 9 to 18 years, depending on constitutional, family antecedents, and racial background. The acceleration of growth in height rates are also variable, not only as to the time of onset but also in degree and duration in terms of years. It may

be at its peak rate during the early phase of sexual maturity, or appear later, just prior to completion of full sexual maturity. In a given individual, a displacement of optimal timing relationship between skeletal growth and sex can occur. Thus the physiological gap in two youngsters may be very considerable indeed. It may be assumed that a 14-year-old boy who is growing twice as rapidly in height, yet maturing sexually half as rapidly when compared to another 14-year-old youngster, is exposing his skeletal structures to stresses and demands perhaps four times as great.

It is this concept that led early in the investigation to the idea of a "relative metabolic insufficiency," meaning insufficiency of a hormone, or foodstuff in the bone, not in the absolute sense, but insufficient in consequence to the greater demands made by the accelerated growth pace. Reasoning of this type is not uncommon in medicine. The increased nutritional demands in puberty and adolescence for calcium, protein, and vitamins are well established, and nutritional deficiency, as a consequence, recognized. These youngsters outgrow their supplies and supply lines. For this reason, one or another of the essential dietary components, vitamins, proteins, and the strategic mineral calcium were pushed up to fivefold of the average requirements. Similarly, although the basal metabolic rate was within normal range of plus to minus 20, the lowered values were suspected as perhaps reflecting thyroid deficiency in the face of the accelerated demands of growth, especially if some other clinical indications were available to point to a hypothyroid possibility. Thyroid medication from 1 to 2 gr. daily was imposed on some of these slowly developing and rapidly growing youngsters, from a period of six months to one year. Although the bone age may be several years retarded in these cases, one may state here categorically that thyroid medication will not accelerate pubertal sex changes or bone development when these are delayed by constitutional or hereditary factors, as most of them are.

Boys whose manifestations of sexual development appeared not only delayed but who also revealed some other evidences of gonadal deficiency, such as maldescent, very small genitalia or testes, were given the benefit of sexual stimulation with the anterior-pituitary-like sex hormone, or male hormone in small doses. Such endeavor never appeared necessary for longer than four to six months' duration, because testicular and genital response appeared to be generally prompt and satisfactory in a short space of time, and the furtherance of therapy beyond this point unjustifiable.

These measures of therapy of "relative insufficiencies" assumed to be present often led to favorable responses as reported by the orthodontists. Progression of root resorption may have been arrested and bony architecture improved in a number of cases. It is, however, impossible to state from this small experience that the specific efforts were the cause of improvement. Because the observation of each child extended over a considerable period of time, and the continuous progression of the individual's own sexual puberty was concomitant, in most of them, the orthodontic improvement could as well be attributed to the progressive flooding with their own hormones rather than to our efforts to tinker with nature.

## DISCUSSION

From the onset, the medical investigator is confronted by the vagaries of medical diagnosis in endocrine disease. As distinct from neoplastic or infectious diseases, the problems of metabolism and nutrition have not only a qualitative, but also pronounced quantitative, aspect as well. A person either has or has not cancer; he does not have a touch of cancer. In nutrition, however, he may not only have scurvy, but very mild scurvy, or latent scurvy. Similarly, there is cretinism, myxedema, and partial hypothyroidism. The quantitative factors of metabolic and endocrine practice, although they open the field by greater flexibility in diagnosis, also add to the difficulty in establishing certainty in the borderline cases, which generally constitute the bulk of cases observed, thus increasing conflicts of opinion among equally qualified medical men regarding identical situations. A so-called "typical" Fröhlich type, whether he is called a neuropituitary or not, may be a hypogonad to one physician, a hypopituitary to another, and normal to a third. One doctor may be disposed to treat him with anterior-pituitary-like sex substance; another, with male hormone; and the third, with expectancy. Now these youngsters do fall into a body pattern, and sometimes do present large central incisors and a high palatal arch. Is then the cause of these oral manifestations pituitary, gonadal, or constitutional?

In metabolic disturbances there is a rough parallelism between the severity of disease and the certainty of diagnosis. A severe disturbance reveals itself in more tissues of the body and in a greater number of biochemical laboratory evidences. A lesser deficiency will disclose itself only in one or another tissue, and may therefore remain in doubt as to its nature. The matter is also dependent on the inherent talents of the tissues on the basis of heredity. A given degree of hypothyroidism in one child may produce striking cerebral impairment in a youngster with poor central nervous system endowments, and considerably less in another with more fortunate cerebral antecedents. This identical situation exists in the effect of thyroid deficiency on oral structures, where a given degree of hypothyroidism may show pronounced dental change, or at times it may not be so severe. It must be remembered that the tissues of the body have their own metabolic rates, and that the metabolism of bone and fat is the least active of all. The total metabolism of the individual is mostly determined by muscle mass. There is, therefore, much room for inherent variabilities for specific oxidations, such as in bone, in a given case and from one individual to another, obviously apparent to anyone practicing a medical science. The bones of one man will be very dense, or the skin of another very fine and irritable. These differences influence the inherent responsiveness of the tissues and have much to do with their reaction to stimuli of equal strength from another source, be it a given level of hormone secretion or trauma. These variations of endowments are intensified during the rapid growth years and there are no means as yet available medically to discern them, to say nothing about evaluating them quantitatively.

The difficulties of the problem of medical assistance to the orthodontist go beyond the difficulties of establishing borderline deficiency or insight of the inherent stubbornness of some tissues in relation to the organism as a whole. The panoramic changes of puberty and adolescence create an intensification of the problems and solutions for the individual, as dramatic as embryonic life itself or pregnancy. The optimal interplay of the phase of puberty is still not known. There is much more to it than the pituitary growth factor, or male or female sex hormone. An active, ample thyroid secretion is a requirement, and the androgeny or estrogeny of the adrenal cortex, as well as its other hormone effects, is also undoubtedly involved. In back of these hormonal factors is the hypothalamus, the prime motivator of them all. The quantitative measurement of pubertal change is accurate enough, as far as linear growth in height is concerned, but does not lend itself easily to the quantitative assays of other physiological variants, hormonal or nutritional. There is a rough correlation between bone age and sexual maturity. The appearance of the pisiform bone in the wrist in girls is known to occur approximately three years prior to the onset of menstruation. Epiphyseal closure and, therefore, linear growth in height ceases eventually with full sexual maturity. However, within this range fall many variations of skeletal age and sex status, and the very definition of sexual maturity is open to discussion. Is the 14-year-old girl who has very scant pubic hair, but who has begun to menstruate, more mature than the 14-year-old girl who has almost the complete quota of pubic hair, but who has failed to menstruate? Which of the two conditions is more favorable for the integrity of bone structure in the face of rapid growth? There is as yet no answer to this in clinical medicine.

On the basis of personal impressions, sexual hair growth appeared to me to be the best indication of the sex aging process, irrespective of the age of the individual, or the size of the genitalia. The degree of fullness of sexual hair of the pubis carried with it definite prognostic significance relative to growth of genitalia, growth in height, bone age, and closure of epiphyses. Since the full significance of this hair-growth is dependent not only on gonadal, but also on adrenocortical and probably cerebral factors, it represents best of all the total sex maturity status of the individual. Some years ago, an effort<sup>2</sup> to define and evaluate sexual maturity was made, in which the degree of pubic hair density was established as the major criterion of change. Practice with this technique made it possible to estimate sexual maturity progress from 25 per cent, 50 per cent, 75 per cent, or 100 per cent of full maturity (full pubic hair quota). The value of this quantitative estimation becomes increasingly apparent when related to other biological processes, and, in its simplest form, with linear growth in height. With the degree of this sex maturity as a point of reference, one can plot growth accelerations, and find a number of distinct sex-growth puberty patterns. In the great majority there is considerable acceleration in growth during the early stage of sexual maturation, that is, before 50 per cent of full bloom is attained. Yet there are many others, approximately 30 per cent, in whom rapid growth seems to continue at an accelerated

pace during the latter half of sexual maturation, sometimes more rapid than in the first half. In still another group, a striking increase in growth has been noted with very little sexual change, which progresses very slowly.

It is in this first half of sexual maturation, i.e., the skeletal height stretching out stage, that metabolic deficiencies are more commonly seen. The growth per se, if rapid, or concurrent with slow sexual developmental change, may thus become causative of a relative nutritional or hormonal insufficiency at a specific tissue site.

Although reliable information is available on the subject of orthodontic changes encountered in endocrine disease,<sup>3</sup> the reverse, i.e., endocrine disease in orthodontics, is quite another matter. It is from the latter point of view that this investigation was undertaken because it constitutes by far the greatest bulk of questions raised by the orthodontist in his everyday problems. The search for an endocrine or specific metabolic disturbance in a given orthodontic case is often a difficult and futile task. The orthodontist should be very cautious in his acceptance of any rapid succession of standard label diagnoses. Unfortunately, a clinical possibility can become a habit diagnosis where a rough approximation to a truth is made to fit some wayward physical or laboratory data into a conventional or popular mold of "thyroid" or "pituitary." The orthodontist would do well to seek from himself and the medical profession, in many of his obscure problems that do not fit into a clear-cut typical endocrinopathy, a better understanding of body development in terms of normal variations of growth rate and sexual change of pubertal years and the effect of their interplay on bone structure and response as it pertains to the problems of orthodontics.

#### SUMMARY

A series of over one hundred random orthodontic problems were studied metabolically over a period of ten years for endocrine disease. Of these only a small percentage could be classified as an endocrinopathy. The greatest proportion of cases were under metabolic suspicion because of roentgenographic evidences of root resorption, alveolar osteoporosis, abnormalities of trabeculation or other evidence of bone dyscrasia. The impression was obtained that these changes were precipitated in a rapidly growing organism noteworthy by excessive acceleration of linear growth concomitant with a slow sexual maturation of puberty. This imbalance between somatic and sexual growth is a variant of the normal pubertal pattern and may be causative of skeletal defects as revealed by the dental roentgenograms. The presence of some insufficiency, hormonal or otherwise, participating in sexual maturation, and its effects on bone structure, cannot be excluded. Since laboratory tests as well as clinical examination from the usual static point of view are normal, the insufficiency may be called relative, i.e., relative to rapid skeletal growth. It is suggested that efforts be made by orthodontists to correlate their findings with studies of patterns of normal pubertal unfolding, particularly in relation to rapid growth and slow sexual maturity, to aid in a definite ascertainment of the effect of these developmental factors on the problems mentioned.

The author wishes to acknowledge with gratitude his indebtedness to Dr. C. F. Stenson Dillon,<sup>1</sup> whose interest and stimulation made this work possible.

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"ORTHODONTIA"

Oh, Dentistry's a curious line  
And wonderful in its way,  
But Orthodontia is the thing  
And about it let me say—  
First its little wires that go poking in between,  
They're pulled and pushed so tightly  
They hardly can be seen,  
How soon these little wires  
The teeth have separated,  
Starting us on the tiresome road  
For them all to be mated.  
Now, my Doctor's clever hands  
Have formed a little cap,  
And a platinum wire round and strong  
To this affair will snap.  
Patiently we pass the days  
Like waiting for the sun,  
Oh, Doctor, Doctor, and dear nurse,  
When will they ever be done?  
I see my picture in a case,  
It is made of plaster white,  
The crossed and crooked teeth  
Are such a horrid, frightful sight.  
"Don't give up," the Doctor says,  
"Have faith in my power to do  
Marvelous things with that little wire,  
Wonderful things for you."  
Were I a boy, I'd leave this land,  
To journey far I would dare,  
But best of all would be the fact,  
I deserted the dentist's chair.  
Now all in all Doc's pretty nice  
And I like him, yes, I do,  
But the time will come when I'll like him best,  
And that is  
WHEN WE ARE THROUGH.

—Pauline Franklin.

(Contributed by Dr. John Taylor.)

## Reports

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### REPORT OF THE MEETING OF THE SOUTHERN SOCIETY OF ORTHODONTISTS, 1951

THE twenty-seventh annual session of the Southern Society of Orthodontists will long be remembered as a most delightful experience, a very beneficial seminar, and one of the most enjoyable meetings in our long and colorful history.

No place in this country is more picturesque and perfect of appointment than the New Greenbrier Hotel in White Sulphur Springs, W. Va. Many of our members and guests arrived a few days early and many stayed after the close of the meeting to enjoy the golf, tennis, horseback riding, and swimming available on the grounds of this beautiful resort hotel. Everyone who attended this meeting enjoyed a relaxing vacation, as well as benefited from a splendid scientific program.

Our total registration at this meeting was 230. Of this number, 92 were members of the Southern Society, 28 were visiting orthodontists from other sectional societies, and the balance were wives, children, exhibitors, and special guests. We in the Southern Society are extremely proud of the fact that so many of our members bring their entire families to our meetings. This in itself indicates the atmosphere that prevails. We are very pleased to have so many visiting orthodontists and special guests, and we are deeply grateful to them for their many kind expressions regarding the warm fellowship they enjoyed while meeting with us.

Meetings of the Executive Board were held Sunday afternoon, all Monday morning, and at breakfast each morning during the meeting. Under the capable guidance of President William H. Lewis, we accomplished many things for the welfare of our organization, among which was the election of seven new active members, twelve new associate members, four affiliate members, and one honorary member.

The Society was complimented by the presence of Dr. J. H. Cocks, President of the Virginia State Dental Association; Dr. James E. Johns, Trustee of the Fifth District of the American Dental Association; and Dr. E. F. Hodges, prominent dentist from Petersburg, Va., the home town of our president. These men came to us principally because of their admiration and devotion to our President, Dr. William H. Lewis. Each, however, took the opportunity to express to us in a few well-chosen words his appreciation for the position that orthodontics occupies in the profession of dentistry today. They made us very cognizant of the fact, however, that we must not limit our interest and efforts to the special field of orthodontics alone, but as leaders in the profession of dentistry, we must keep abreast of the problems that confront our entire profession today and lend our untiring efforts to our basic profession and not just our chosen special field.

We were proud of the scientific program presented at this meeting. Our featured essayists were: Dr. George Anderson, Baltimore, Md.; Dr. John R.

Thompson, Chicago, Ill.; Dr. Joseph R. Jarabak of Gary, Ind., and Chicago, Ill. Each of these men gave us much food for thought. Many practical and beneficial ways of "know-how" were clearly and challengingly presented to us. Very interesting and beneficial case reports were presented to us by our own members: Dr. James C. Brousseau, of Baton Rouge, La.; Dr. W. A. Buhner, of Daytona Beach, Fla.; Dr. H. D. Jaynes, of Atlanta, Ga.; and Dr. W. J. Turbyfill, of Asheville, N. C.



—Chase-Greenbrier Photo, White Sulphur Springs, W. Va.

*Left to right:* George Prewitt; Hal Terry; Jeff Lunsford; Leigh Fairbank; Bill Jarrett, Vice-President; Frank P. Bowyer, Secretary-Treasurer; William Lewis, President; Leland Daniel; Olin Owen; Walter T. McFall, President-Elect; Bernard G. deVries, President, American Association of Orthodontists; Faustin Weber; Burke Coomer; J. E. Brown.

One afternoon of our scientific session was devoted to table and progressive clinics. All of these clinics were outstanding and would merit a place on any orthodontic program. The progressive clinics were given by: Dr. William H. Oliver, of Nashville, Tenn.; Dr. Andrew Francis Jackson, of Philadelphia, Pa.; Dr. Thad Morrison, Jr., of Atlanta, Ga.; Drs. E. C. Lunsford, Hal Terry, and R. B. Clark, of Miami, Fla. The table clinics were given by Drs. Orville Van Deusen, of Winchester, Va., Amos Bumgardner, of Charlotte, N. C., Leigh Fairbank, of Washington, D. C., Steve Hopkins, of Washington, D. C., Tom Pryse of Bolling Air Force Base, and Norris C. Leonard, of Nashville, Tenn.

Our exhibit committee did a splendid job of obtaining ten commercial exhibits for this meeting. As always, these exhibits added much to our meeting and served to keep us informed on the latest equipment, materials, and so forth.

If we can say this meeting had a single highlight, it would have to be the luncheon honoring Uncle Jake Gorman, of New Orleans, La., a charter member and second president of the Southern Society. This luncheon was attended by all members, guests, and ladies. The principal speaker was our very distinguished and capable president of the A. A. O., Dr. Bernard G. deVries. He captivated the entire group as he told in inimitable and inspiring fashion the history of the A. A. O., its rapid increase in membership, the rapid advancements we are making in every way, the many beneficial things that the A. A. O. means and does for us, and, last but not least, our individual responsibilities to the A. A. O. As a result of his appearance on our program, all the younger men and many of the older men have a much more thorough understanding of the organizational setup, the purpose, the function, and the importance of our American Association.

At our business session the following officers were elected and installed: President, Dr. Walter T. McFall, of Asheville, N. C.; Vice-President, Dr. W. H. Street, of Richmond, Va.; President-Elect, Dr. Leland T. Daniel, of Orlando, Fla.; Secretary-Treasurer, Dr. Frank P. Bowyer, of Knoxville, Tenn. This year we elected an assistant-secretary to aid the secretary-treasurer with his many duties. Dr. M. D. Edwards, of Montgomery, Ala., was elected to this office. We also elected an associate editor to assist our sectional editor to the AMERICAN JOURNAL OF ORTHODONTICS. Dr. Hal Terry, of Miami, Fla., was elected to this office.

Upon the recommendation of President Lewis, the Southern Society voted to approve the organization of an S. S. O. Ladies' Auxiliary. The ladies organized their auxiliary at this meeting and the following officers were elected:

President, Mrs. Frank P. Bowyer, Knoxville, Tenn.

Vice-President, Mrs. William Jarrett, Charleston, W. Va.

Secretary, Mrs. William Oliver, Nashville, Tenn.

Treasurer, Mrs. Burke Coomer, Louisville, Ky.

The Society voted to hold the next annual meeting at Asheville, N. C., at the Grove Park Inn., Aug. 10, 11, 12, and 13, 1952. We extend a cordial invitation to each of you to attend this meeting and assure you that you will enjoy a delightful four days, a wealth of warm southern fellowship, and a most interesting and educational scientific program.

This report would not be complete without adequate words of praise to Dr. William H. Lewis, of Petersburg, Va., who served as President of our Society this past year. Under his capable leadership, we have enjoyed one of the most successful years in the history of our organization. It has been said that behind every truly successful man is an able and charming wife. This certainly is most true in the case of Dr. William H. Lewis. His lovely wife, Helen, and his charming daughter, Anne, are not only a great inspiration to him but contributed greatly to the dignity and success of our meeting.

Respectfully submitted,

FRANK P. BOWYER, Secretary-Treasurer,  
OREN A. OLIVER, Editor.

## In Memoriam

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**MATTHEW N. FEDERSPIEL**  
1879-1951

**M**ATTHEW N. FEDERSPIEL was born in Lincoln Township, Kewaunee County, Wisconsin, in 1879. After attending the local primary school he entered the high school at Eagle River, Wis. Subsequently, he enrolled in the dental department of the Milwaukee Medical College, from which he graduated in 1900.



MATTHEW N. FEDERSPIEL

Dr. Federspiel was located in Racine for the practice of dentistry shortly after receiving his degree. There he met and married Bertha A. Knocke in 1903. In 1904 he took the late Dr. E. H. Angle's course in orthodontics, after which he moved to Milwaukee, to begin the practice of orthodontics as a specialty. Not long thereafter he became a teacher of this subject in Marquette University School of Dentistry. His boundless energy and great enthusiasm led him to begin the study of medicine. He graduated in medicine at Marquette in 1910 and thereafter he became professor of oral surgery in both the medical and dental faculties. Beginning in 1919 he restricted his practice to oral surgery.

For many years Dr. Federspiel maintained an office at 1403 N. Astor Street in Milwaukee, and he was an active member on the staffs of Milwaukee, St. Joseph,

and St. Michael Hospitals. In 1927 he published his well-known book on *Hare Lip and Cleft Palate*, and he also was the author of numerous articles in dental and medical literature.

In addition to membership in local and state dental and medical societies he was a member of the American Medical Association, American Dental Association, American College of Surgeons, American College of Dentists, American Board of Plastic Surgeons, and the American Association of Orthodontists. He served as president of the last named society in 1917. He was also honored by membership in the Sociedad Odontologica de Chile.

For many years he maintained a summer home on the western shore of Lake Winnebago, near Oshkosh, Wis. His hobbies included hunting, boating, the care of fine hunting dogs, the raising of South American beavers, and the ownership of a dairy farm.

Dr. and Mrs. Federspiel left Milwaukee on August 24, for a month's vacation at Minocqua, Wis. He died suddenly of a coronary thrombosis in the early morning hours at this resort on September 6. His funeral was held in Milwaukee on Saturday, September 8. In addition to his wife, he leaves a brother, Dr. Peter Federspiel, and three sisters, all of Racine, Wis.

Dr. Federspiel was a devoted husband, successful practitioner, and conscientious professional gentleman. His enthusiasm for his art and science knew no bounds. Always eager to advance our knowledge and improve the modes of practice, he was always willing to help the beginner. The healing arts have lost a brave and valiant leader.

### **Southern Society Honors Orthodontic Pioneer, Jacob Allen Gorman**

**D**R. GORMAN, better known to most of us as "Uncle Jake," was born in Raleigh, N. C., in 1875. He was educated in the public schools of Washington, D. C., and received his D.D.S. degree from Columbian University, Washington, in 1898. His orthodontic training was in the Angle School in 1903. He practiced general dentistry in Asheville, N. C., from 1898 to 1907, and then moved to New Orleans to enter the exclusive practice of orthodontics. He has been a member of the American Association of Orthodontists since 1903 and was one of the charter members of the Southern Society of Orthodontists in 1921. He was the second president of the Southern Society in 1923. Since the beginning of his dental practice, he has been a member of the Local, State, and American Dental Associations. He served in various offices of the New Orleans Dental Association and Louisiana State Dental Society.



JACOB ALLEN GORMAN

During his years of dental practice he contributed several articles for publication, and since limiting his practice to orthodontics, has done a great deal for our profession. He is often referred to as the "Father of Orthodontics in the South."

Uncle Jake has been a most enthusiastic member of both the Southern Society and American Association of Orthodontists. He has missed very few meetings of either society during his time in orthodontics. He has been an inspiration to many orthodontists and particularly the younger ones. It is due to the efforts of men like him that orthodontics has progressed so rapidly in the last fifty years.

The recent meeting of the Southern Society held at White Sulphur Springs, W. Va., was dedicated to him and a luncheon was given in his honor. He has now retired from active practice and was elected to honorary membership in the Southern Society.

We will be looking forward to seeing his face in the front row at our meetings for many years.



## Department of Orthodontic Abstracts and Reviews

Edited by

DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City

### **Physiological Tooth Migration and Its Significance for the Development of Occlusion. I. The Biogenetic Course of the Deciduous Dentition:** By Louis J. Baume, *J. D. Res.* 29: 123-132, April, 1950.

"For the purpose of ascertaining more detailed information on the physiological changes in the human dental arches, a clinical study of their growth and development in 60 children was made over a period of 8 years. Through careful recording an attempt was made to determine the biogenetic course of the deciduous dentition as well as the biogenesis of the accessional and successional teeth."

#### **"I. THE BIOGENETIC COURSE OF THE DECIDUOUS DENTITION"**

"In order to determine developmental changes in the deciduous dental arches, plaster reproductions were made annually of 30 children; 29 of these had their first impressions taken between 3 and 4½ years of age and one at birth. A fine caliper was used on each cast to make the following measurements:

"(a) The length in mm. of the deciduous arch, i.e., the perpendicular distance from a line connecting the two postlactea (pl), to the infradentale (id) or prosthion (pr) (Figs. 1A, 2A).

"(b) The width in mm. between the deciduous canines, i.e., intercanine distance (c-c). This was measured between the centers of the lingual cinguli at the gingival margin instead of between the cusp points, which flatten out as attrition progresses. The possible error by this procedure does not exceed  $\pm 0.2$  mm. (Fig. 2B).

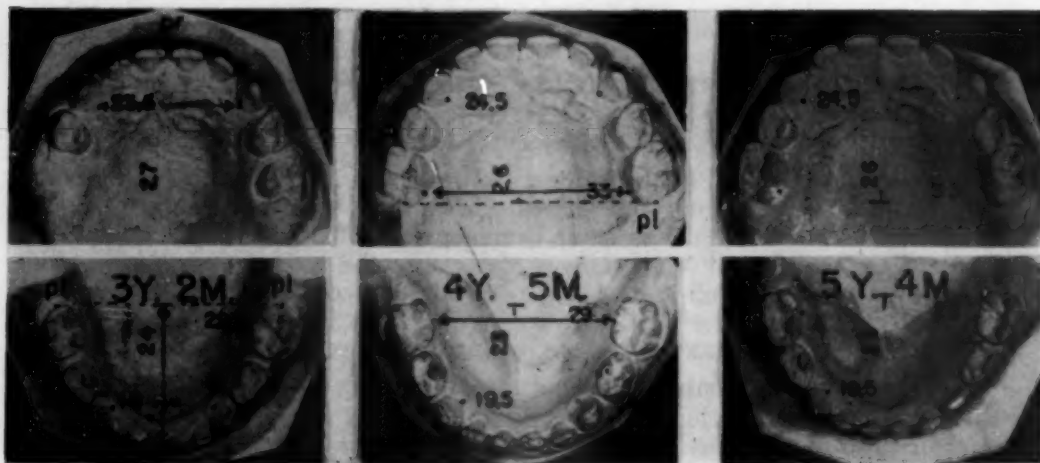
"(c) The width in mm. between the two second deciduous molars, i.e., intermolar distance ( $m_2$ - $m_2$ ). This measurement was taken between the lingual developmental grooves at the gingival margin instead of between the changing occlusal surfaces (Fig. 1B)."

"... during the period from 4 to 6 years the length of the maxillary dental arches remains unchanged in 25 cases (89 per cent) and that of the mandibular arches is constant in 23 cases (83 per cent). A slight decrease in length is noted in 6 cases in the maxilla and in 8 cases in the mandible, mainly between 3 and 4 years of age. In only 3 cases is this shortening coincidental for both arches. The decrement ranges between 0.5 mm. and 1.5 mm. No increase in length is observed in any of these cases.

"... the measurements of the transverse width of the maxillary deciduous arches at different periods. No change in the intercanine width between 4 and 6 years is observed in 24 (80 per cent) of the cases. Five cases reveal an increase in width of 0.5 mm. and one case of 1 mm. during the same interval. The distance between the second deciduous molars is not altered in 25 (83 per cent) of the cases. In 4 cases an increment of 0.5 mm. and in one case of 1 mm. is noted. Twenty-one cases (70 per cent) show interdental spaces between the upper anteriors, while 9 cases (30 per cent), exhibit no spaces.

"... The lower intercanine width remains equal in 26 cases (86 per cent) and similarly for the intermolar distance in 24 cases (80 per cent). An increment in intercanine width is found in 3 cases, and a decrement in one case. Nineteen cases (63 per cent) show spacing in the lower anteriors and 11 cases (37 per cent) no spaces.

"... the average intercanine width at the age of  $5\frac{1}{2}$  years noted separately for the cases with interdental spaces (Type I) and without interdental spaces (Type II)." "... in maxillary arches with spaces the average value is 1.7 mm. higher than in arches without spaces. A similar difference of 1.5 mm. is seen in the mandibular arches.



A.

B.

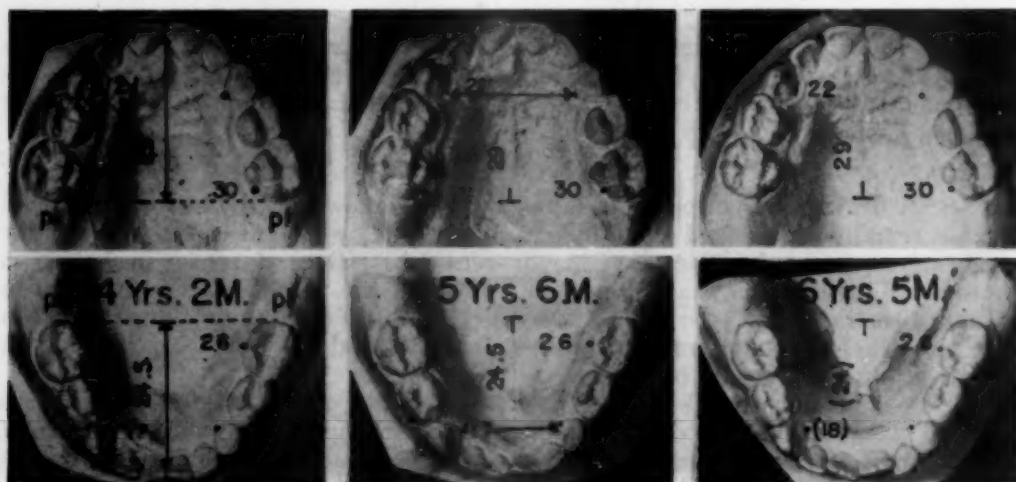
C.

Fig. 1.—Development of a deciduous dentition *with* spacing. Type I (Case 57).

A, Model measured at 3 years, 2 months. Note eruption of the second deciduous molars and canines.

B, Model measured at 4 years, 5 months. Note increase in intercanine width and decrease in length of arches due to a mesial migration of the second deciduous molars.

C, Model measured at 5 years, 4 months. No change in width and length of the arches occurred between B and C.



A.

B.

C.

Fig. 2.—Development of a deciduous dentition *without* spaces. Type II (Case 40).

A, Model measured at 4 years, 2 months.

B, Model measured at 5 years, 6 months. No changes in dimension of the arches are seen.

C, Model measured at 6 years, 5 months. Note slight increase in the intercanine width of both lower and upper upon eruption of the mandibular permanent first incisors and slight secondary spacing between upper incisors.

"The comparison of the plaster reproductions of each case taken seriatim at various ages revealed conclusions in the following respects:

"1. *The Length of the Deciduous Arches.*—From about the age of 4 years until the eruption of the permanent molars the sagittal dimensions of upper and

lower dental arches remained unchanged. A slight decrease in this dimension can occur either as the result of mesial migration of the deciduous second molars just after their eruption (Fig. 1, A and B) or following the development of dental caries in proximal surfaces of molar teeth. Not a single case substantiated the theory that there is a forward growth of the alveolar frontal sections during the period of the primary dentition as propounded by almost every textbook author. . . .

"2. *The Intercanine and Intermolar Width.*—Only minor changes in the transverse dimensions of the upper and lower deciduous arches were apparent during the period of observation. An increment of 0.5 mm. in less than 20 per cent of these cases certainly cannot sustain the general concept of continuously increasing dimensions of the deciduous arches. . . .

"3. *Physiological Spacings.*—After complete eruption of the deciduous teeth no physiological spacing occurred. There was no increase in interdental space in those arches with separated teeth and no spacing developed in the arches in which the teeth were in contact. The above findings also show that no adequate extension of the deciduous arches took place between 3 and 5½ years. This confirms Clinch's observation that he has never seen a case in which the spacing developed after full eruption of all deciduous teeth. The literature does not contain one illustration of the development of a physiological spacing of the deciduous dentition in the same individual between 3 and 6 years. The arrangement of the deciduous teeth is found to exist in either one of two forms; it is spaced (Fig. 1) or closed (Fig. 2), and one does not develop from the other. The spaced form will be referred to as Type I, the closed as Type II.



A.

B.

Fig. 3.—A, Primate spaces in the maxillary arch between second incisor and canine, and in the mandibular arch between canine and first deciduous molar of a deciduous dentition. Note that the primitive character of the deciduous dentition is accentuated by the fact that the canines project through the plane of occlusion very markedly.

B illustrates the manifestation of mandibular primate spaces at the time of eruption of the deciduous canines (Case 50).

"The distribution of spaces in Type I showed all possible variations; even combinations with Type II in the opposing arch occurred. In 1943 the author reported two frequently observed types of spaces; those between the deciduous upper second incisors and canines and others between the deciduous lower canines and first molars. Models taken from the time of eruption indicated that these diastemata were not the result of functional adaptation but rather due to an inherent pattern. There were already present at the time of eruption of the deciduous cuspids (Fig. 3). These diastemata were interpreted as the so-called 'primate spaces' in human deciduous dentition. The occurrence of interlocking long deciduous canines was recognized as further evidence of a primitive feature of the deciduous set. . . .

"It was not unusual to find cases of Type II which showed slightly crowded anteriors (examples will be demonstrated in Part III, Figs. 2 and 3). As previously stated the deciduous arches without spacing were an average of 1.5 mm. narrower than those with spaces. . . . Evidently the absence of spaces was not always due only to a greater width of the deciduous anteriors but also to the lack of sufficient alveolar growth, or to a combination of both. Thus most of

the cases of Type II may fall under Angle's Class I of malocclusion. A spacing of the upper deciduous anteriors shortly after eruption of the lower permanent ones will be described later.

"... The presence or absence of spaces in the deciduous dentition may be a hereditary characteristic in that among identical twins both members have either one form or the other.

"4. *Anteroposterior Relationship of the Arches.*—It is suggestive from the results of these measurements that no essential changes in occlusion can take place during the period of the completed deciduous dentition. A comparative study of the models also showed no indication of a physiological mesial shift of the mandible or a forward adjustment of the mandibular teeth after the age of 4. The relationship of the opposing deciduous canines, as well as the position of the distal surfaces of the upper and lower second molars, remained unchanged throughout the period of completed deciduous dentition. While the terminal plane of the arches was found to be straight in 26 cases (76 per cent) and showed a mesial step in the other 4 cases (14 per cent) this did not develop from one pattern into the other except under environmental influences. The mesial step can be due to a morphological variation in size of the opposing second molars as in instances in which the upper and lower molars are approximately of the same mesiodistal length. Generally the upper molar is shorter mesiodistally than the lower which effects a straight terminal plane. In cases of malocclusion also, there was no change in intermaxillary relationship. The distal terminal step and a cusp-to-cusp occlusion of the deciduous canines in distocclusion remained constant. The distal terminal step is found when the upper deciduous molar occludes mesially to the lower one.

"Although the deciduous dental arches were not involved in any growth changes after their formation, there was, however, vertical growth of the alveolar processes. This increase in height of the alveolar process is demonstrated on diagraphic reproductions. . . . Environmental influences such as compression (thumb sucking, etc.), as well as attrition may affect the deciduous dentition."

#### "SUMMARY"

"A study was made to learn the extent and rate of physiological tooth migration and the mechanism which determines the development of occlusion. This is the first of four papers and deals with the development of the deciduous dentition from 3 to 5½ years. Plaster reproductions of the deciduous dental arches of 30 children taken seriatim at various developmental stages were measured and examined for changes in morphology. The findings may be summarized as follows:

"1. After the deciduous dental arches were completely formed, their sagittal and transversal dimensions were not altered except when subjected to inadequate environmental influences.

"2. Two consistent morphological arch forms of deciduous dentures were found; the arches were either continuously spaced or continuously closed. Spaces in the deciduous denture were not developmental, but congenital. Closed arches were on an average narrower transversally than spaced ones.

"3. The spaced arches frequently exhibited two distinct diastemata; one between the mandibular deciduous canine and first deciduous molar and the other between the maxillary second deciduous incisor and deciduous canine. These were interpreted as 'primate spaces.'

"4. The terminal plane of the arches in occlusion remained constant.

"5. Vertical growth of the alveolar processes concomitant with the development of the successional tooth germs and sagittal growth concomitant with the development of the accessional tooth germs was observed.

"6. The present concept of physiological changes of the deciduous dental arches through spacing and through mesial shifting of the mandibular teeth was not confirmed by the above observations."

## News and Notes

### The 1952 Meeting of the American Association of Orthodontists

The 1952 meeting of the American Association of Orthodontists will be held at the Jefferson Hotel, St. Louis, Mo., April 21 to April 24.

The chairman of the Local Arrangements Committee is Leo M. Shanley, 7800 Maryland Ave. The following local committees have been named to make the arrangements for the meeting:

<i>Local Arrangements</i>		
Leo M. Shanley, Chairman	7800 Maryland Ave.	St. Louis, Mo.
E. V. Holestine, Treasurer	8015 Maryland Ave.	St. Louis, Mo.
Otto W. Brandhorst	4952 Maryland Ave.	St. Louis, Mo.
George H. Herbert	7002 Pershing Ave.	St. Louis, Mo.
Benno E. Lischer	313 N. Rock Hill Road	Webster Groves, Mo.
Albert C. Mogler	462 N. Taylor Ave.	St. Louis, Mo.
H. C. Pollock	8015 Maryland Ave.	St. Louis, Mo.
Frank C. Rodgers	Missouri Theatre Bldg.	St. Louis, Mo.
Henry F. Westhoff	Missouri Theatre Bldg.	St. Louis, Mo.
Joseph H. Williams	3722 Washington Blvd.	St. Louis, Mo.
<i>Stag Dinner</i>		
Joseph H. Williams, Chairman	3722 Washington Blvd.	St. Louis, Mo.
Robert E. Bedell	1504 S. Grand Ave.	St. Louis, Mo.
Carl L. Rister	University Club Bldg.	St. Louis, Mo.
George Herbert	7002 Pershing Ave.	St. Louis, Mo.
<i>Ladies' Entertainment</i>		
Earl C. Bean, Chairman	120 N. Forsythe Blvd.	St. Louis, Mo.
<i>Co-Chairmen</i>		
Mrs. B. G. deVries	40 Fair Oaks	St. Louis, Mo.
Mrs. H. C. Pollock	160 S. Gore Ave.	Webster Groves, Mo.
Mrs. Otto W. Brandhorst	24 S. Gore Ave.	Webster Groves, Mo.
Mrs. Joseph H. Williams	5 Glen Forest	St. Louis, Mo.
Mrs. Leo M. Shanley		
<i>Press</i>		
H. F. Westhoff, Chairman	Missouri Theatre Bldg.	St. Louis, Mo.
H. C. Pollock	8015 Maryland Ave.	St. Louis, Mo.
<i>Banquet and Luncheons</i>		
Virgil A. Kimmey, Chairman	3722 Washington Blvd.	St. Louis, Mo.
Robert E. Hennessy	8013 Maryland Ave.	St. Louis, Mo.
Robert C. Byrne	2602 S. Grand Ave.	St. Louis, Mo.
<i>Clinics</i>		
Otto W. Brandhorst, Chairman	4952 Maryland Ave.	St. Louis, Mo.
Virgil A. Kimmey	3722 Washington Blvd.	St. Louis, Mo.
J. E. Rook	6651 Enright Ave.	St. Louis, Mo.
<i>Registration</i>		
George Moore, Chairman	Box 8	Ann Arbor, Mich.
John Byrne, Co-Chairman	2602 S. Grand Ave.	St. Louis, Mo.
<i>Commercial Exhibits</i>		
Earl E. Shepard, Chairman	4500 Olive St.	St. Louis, Mo.
William S. Brandhorst	4952 Maryland Ave.	St. Louis, Mo.
Fred Fabric	4559 Scott Ave.	St. Louis, Mo.

*Hosts*

Leo B. Lundergan, Chairman	4500 Olive St.	St. Louis, Mo.
Robert M. Courtney	University Club Bldg.	St. Louis, Mo.
Kenneth C. Marshall	35 N. Central	St. Louis, Mo.
Quentin M. Ringenberg	3722 Washington Blvd.	St. Louis, Mo.

*Property*

A. C. Mogler, Chairman	462 N. Taylor	St. Louis, Mo.
Paul E. Spoeneman	16 Hampton Village Plaza	St. Louis, Mo.
E. W. Hodgson	Missouri Theatre Bldg.	St. Louis, Mo.

*Reception*

H. C. Pollock, Chairman	8015 Maryland Ave.	St. Louis, Mo.
Benno Lischer	313 N. Rock Hill Road	Webster Groves, Mo.
Frank C. Rodgers	Missouri Theatre Bldg.	St. Louis, Mo.
Joseph Williams	3722 Washington Blvd.	St. Louis, Mo.
Otto W. Brandhorst	4952 Maryland Ave.	St. Louis, Mo.

*Hotel Reservations*

J. E. Rook, Chairman	6651 Enright	St. Louis, Mo.
H. C. Pollock, Jr.	8015 Maryland Ave.	St. Louis, Mo.

*Information*

George Herbert, Chairman	7002 Pershing Ave.	St. Louis, Mo.
Clarence R. Geier	3417 Meramec Ave.	St. Louis, Mo.
Everett W. Bedell	1504 S. Grand	St. Louis, Mo.

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### American Board of Orthodontics

The next meeting of the American Board of Orthodontics will be held at the Hotel Jefferson, St. Louis, Mo., April 16 to April 20, 1952. Orthodontists who desire to be certified by the Board may obtain application blanks from the Secretary, Dr. C. Edward Martinek, 661 Fisher Bldg., Detroit 2, Mich. To be considered at the St. Louis meeting, all applications must be filed before March 1, 1952.

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### Prize Essay Contest, American Association of Orthodontists

*Eligibility.*—Any member of the American Association of Orthodontists; any person affiliated with a recognized institution in the field of dentistry as a teacher, researcher, undergraduate or graduate student shall be eligible to enter the competition.

*Character of Essay.*—Each essay submitted must represent an original investigation and contain some new significant material of value to the art or science of orthodontics.

*Prize.*—A cash prize of \$500 is offered for the essay judged to be the winner. The committee, however, reserves the right to omit the award if in its judgment none of the entries is considered to be worthy. Honorable mention will be awarded to those authors taking second and third places. The first three papers will become the property of the American Association of Orthodontists and will be published. All other essays will be returned.

*Specifications.*—All essays must be typewritten on 8½ by 11 inch white paper, double-spaced with 1 inch margins, and composed in good English. Three copies of each paper, complete with illustrations, bibliography, tables, and charts must be submitted. The name and address of the author must not appear in the essay. For purposes of identification, the author's name, together with a brief biographical sketch which sets forth his or her dental

and/or orthodontic training, present activity and status (practitioner, teacher, student, research worker, etc.), should be typed on a separate sheet of paper and enclosed in a sealed envelope. The envelope should carry the title of the essay.

*Presentation.*—The author of the winning essay will be invited to present it at the meeting of the American Association of Orthodontists to be held at St. Louis, Mo., April 21-24, 1952.

*Final Submission Date.*—No essay will be considered for this competition unless received in triplicate by the Chairman of the Research Committee on or before March 1, 1951.

J. A. SALZMANN, CHAIRMAN, RESEARCH COMMITTEE,  
AMERICAN ASSOCIATION OF ORTHODONTISTS,  
654 MADISON AVE.,  
NEW YORK 21, N. Y.

### Central Section of the American Association of Orthodontists

Under the leadership of President P. M. Dunn the Central Section of the American Association of Orthodontists held its regular meeting at the Lowry Hotel, St. Paul, Minn., Oct. 1 and 2, 1951.

The scientific program follows:

Welcome. A. T. Thorson, President, St. Paul District Dental Society.

President's Message. P. M. Dunn, Minneapolis, Minn.

Diagnosis and Prognosis of Various Types of Class II, Division 1 Malocclusions. Bercu Fischer, D.D.S., New York, N. Y.

Organizational Responsibilities of Orthodontists. B. G. deVries, D.D.S., Minneapolis, Minn.

Relation of Cleft-Palate Surgery to Malocclusion. Wayne B. Slaughter, M.D., D.D.S., Chicago, Ill.

Variations of the Temporomandibular Joint Associated With Malocclusions. Robert M. Ricketts, D.D.S., M.S., Chicago, Ill.

What Does Extraoral Anchorage Accomplish? Beulah Nelson, D.D.S., Oak Park, Ill.

Guides Used in Deciding to Extract Teeth in Treating Class I Malocclusions. George A. Dinham, D.D.S., Duluth, Minn.

Some Relations of the Upper Anterior Teeth to the Lower Anterior Teeth as Present in a Group of Acceptable Occlusions. S. R. Steadman, B.S., D.D.S., M.S., St. Paul, Minn.

Problems in Altering Children's Habitual Activities. Paul C. Benton, M.D., Minneapolis, Minn.

#### 1:30-4:00 TABLE CLINICS

Treatment of Deciduous Cases. Charles R. Baker, Evanston, Ill.

Various Practical Applications of the Headcap in Orthodontic Treatment. Arthur A. Block, Chicago, Ill.

Relation of Tooth Size in the Mandible and Maxilla. William S. Brandhorst, St. Louis, Mo.

Full Facial Casts. Benjamin B. Cantor, Winnipeg, Canada.

Modified Hawleys. Maynard E. Cook, Austin, Minn.

Edgewise Arch—Partial Elimination of Mass Movement. Howard N. Delbridge, Beloit, Wis.

Class I Extraction Cases. George A. Dinham, Duluth, Minn.

Cases, Not Retained, One Year After Treatment According to Tweed's Concepts. George L. Englert, Danville, Ill.

Making Cast Cuspid Bands. Guy B. Fairchild, Duluth, Minn.

Extraction and the Overbite Problem. Abraham Goldstein, Chicago, Ill.

An Appliance for Uprighting Tipped Molars and Regaining Space. L. B. Higley, Iowa City, Iowa.

Attachment for Impacted Cuspids and Supplying Missing Anterior Teeth During Treatment. Maurice A. Hoghaug, Grand Forks, N. D.

Extraoral Anchorage With the Johnson Twin Arch Appliance. W. M. Jacobsen, Minneapolis, Minn.

Orthodontic Treatment for the Three to Four Year Old. Marion E. Maule, Waterloo, Iowa.

Adult Orthodontics Preparatory to Bridgework. L. W. McIver, Minneapolis, Minn.

Preventive Orthodontics. D. M. Mehrens, Sioux Falls, S. D.

Cases Treated With Extraoral Anchorage. Beulah G. Nelson, Oak Park, Ill.

The Sved Bite Plane. Jay N. Pike, Minneapolis, Minn.

A Portable Cephalometer. D. F. Rasmusson, Fargo, N. D.

Selecting the Beginning Arch Wire in the Edgewise Technique. Earl W. Renfro, Chicago, Ill.

Laminagraphs of Temporomandibular Joints. Robert M. Ricketts, Chicago, Ill.

Overlay Appliances for Expansion on Deciduous Teeth. Merlin A. Spain, Omaha, Neb.

Specific Space Closure. S. R. Steadman, St. Paul, Minn.

A Technique for Changing Habit Patterns. D. J. Thompson, Elmhurst, Ill.

Personalized Details Conducive to Successful Treatment. Leonard P. Wahl, Wassau, Wis.

Types of Orthodontic Treatment for Adults and Children. Floyd L. Wentworth, St. Paul, Minn.

### Rocky Mountain Society of Orthodontists

The program of the annual fall meeting of the Rocky Mountain Society of Orthodontists, to be held in Denver, Colo., Nov. 5 and 6, 1951, follows:

#### *Monday, Nov. 5, 1951*

Registration—Study Club Rooms of the Denver Dental Association, Denver General Hospital.

Dr. Andrew F. Jackson. Basic Principles of Universal Application and Types of Appliances Best Suited to Carry These Principles Into Effect.

Dr. John T. Jacobs. Physical Characteristics of Bone and Muscle.

Case Reports.

Luncheon—Press Club.

Dr. Andrew F. Jackson.

#### *Tuesday, Nov. 6, 1951*

Dr. Ernest T. Klein. Pressure Habits; Etiological Factor in Malocclusion.

A Motion Picture Study of Childhood Habits Which Affect Dental Occlusion and Facial Development.

Dr. Andrew F. Jackson.

Case Reports.

Panel Luncheon—Press Club. Dr. Henry F. Hoffman, Dr. Wm. R. Humphrey, Dr. Andrew F. Jackson, Dr. J. Lyndon Carman, Moderator.

Dr. Andrew F. Jackson.

### The George Wellington Grieve Memorial Lecture

The George Wellington Grieve Memorial Lecture was featured as an Editorial in the September, 1950, issue of this JOURNAL. Since that time contributions have been received from interested friends. To date the halfway mark has been reached. The Grieve Memorial Annual Lecture will serve as a stimulus to future accomplishments in the field of preventive orthodontics.

Those who wish to have a part in this memorial may send contributions to Dr. Don W. Gullett, Secretary, Canadian Dental Association, 234 St. George St., Toronto 5, Ontario, Canada.

THE GEORGE GRIEVE MEMORIAL COMMITTEE.

### **Federal Security Agency, Children's Bureau, Washington, D. C.**

Dr. Martha M. Eliot made the following statement on assuming office as Chief of the Children's Bureau:

The President has done me great honor in appointing me as the fourth Chief of the Children's Bureau. It is with real satisfaction and pleasure that I return to work with so many old friends, but it is also with a sense of great responsibility. To follow in the footsteps of such great leaders as Julia Lathrop, Grace Abbott, and Katharine Lenroot is no easy task.

Each of these leaders, as she assumed office, cut out a job to do for children—a job that was keyed to the times, and the resources available. I, too, must accept certain limitations of the times, those imposed by defense needs and by crucial international considerations.

But even within these limitations, there is a great deal more that the Nation can do for its children than it is now doing.

I want to see how fast and how far we can get in these directions:

1. Let us take vigorous steps to decrease the number of prematurely born infants and to save many more of those who are prematurely born. This is the biggest front remaining in the battle to help all our babies live safely through their first year of life. It means better maternal care, as well as better infant care.
2. We must make sure that each mother not only comes through the maternity period alive, but with abounding health for herself and her child.
3. I hope we can wipe out the "black market" in babies. We know what good adoption laws and practices are, and we have demonstrated how effectively they can protect the rights of the child, his natural parents, and his adoptive parents. Let's get them operating and used everywhere.
4. We must tackle the problem of preventing all kinds of congenital defects, find ways of preventing them, and improve our techniques in helping children to overcome the handicaps that cannot be prevented. This calls for more research and for spreading knowledge about preventives that we already have. No "blue" baby should go without surgical care if it will help him.
5. Let us step up our work for children with epilepsy and other chronic conditions. With the new diagnostic and treatment practices we have right now for epilepsy, we could enable 80 per cent of children with epilepsy to lead normal, useful lives if we were to make sure that everyone got the proper treatment and care.
6. We must determine to do a great deal more for the many thousands of children who do not hear or see well. Ways and means are known. They call for combined action of parents, doctors, teachers, psychologists, and social workers. We need hearing and speech centers accessible everywhere to children with impaired hearing.
7. We must get a great deal more skilled help to children before they get into trouble with society. This means building up our social and health services for children in their own homes and communities. We already know much about the emotional problems which lead many children along the road to juvenile courts. It is time we applied this knowledge to prevent juvenile delinquency.
8. Let us wipe out every trace of brutal, degrading, and harsh treatment of youngsters in our training schools, and substitute informed and intelligent handling of these children so that they are helped to fit into society instead of fighting it all their lives.
9. Let us see how many parents, doctors, nurses, social workers, teachers, and other children's workers can be helped to understand what is known about the emotional and

social development of children, so that they can put this knowledge into their everyday dealings with parents and with children. We should start on this job in the doctor's office; in maternity and child health clinics; in nursery schools and day nurseries.

The most important task to be undertaken in the decade ahead is to spread to all parents and to all people working with children an understanding of how and why a warm, close, parent-child relationship in infancy and childhood can give a child the sense of security he needs for insulation against his own feelings of frustration and his desire for uncontrolled aggression.

Obviously these are goals not just for the Children's Bureau but for the Nation. No single agency or group of professional workers can do this job alone. The Children's Bureau needs and wants the cooperation of all types of agencies and organizations, public and voluntary, professional and nonprofessional.

I believe, however, that the Children's Bureau must continue to be the focal point for the Nation at which new facts about children and their needs are assembled, and from which new knowledge flows to individual citizens and to states and communities operating services under grant-in-aid programs.

The Bureau has long since demonstrated its skill and devotion as a champion and spokesman for all children. Its strength has come from working across-the-board on children's needs, from combining fact-finding with service programs, from uniting the knowledge and skills of the many professions working on the health and social welfare problems of children. I propose to build upon that strength.

There are many ways in which all of us, as citizens of a most favored nation, can work toward the better quality job we must do for children. Here are only a few:

1. We must increase greatly our corps of trained workers with children. That means encouraging more young people to enter these professions; knocking down all economic, racial, and sex barriers that stand in the way of able young people getting professional training; making the pay and working conditions of professional workers more attractive; and raising the social prestige we accord the people who dedicate their lives to service for their fellows.

2. A constant flow of new knowledge to professional workers about the causes and treatment of the physical, social, and emotional handicaps of children must be maintained. We need to know much more about the influence of different cultural patterns on family and community life.

3. We need more studies of the effectiveness of our health and welfare programs for children to be sure that our services contribute to the well-being of children in the most productive way possible.

4. We must be more experimental in our ways of getting services to children. A problem that is too big for one state to solve may be licked by a group of states working together. The Children's Bureau is using this technique in getting highly skilled surgical treatment to children with cardiac troubles. It can be applied in other fields.

5. We must bring about a closer tie-up between citizens and their public and private services for children. The Midcentury White House Conference on Children and Youth did a magnificent job of mobilizing such citizen concern. The many excellent beginnings made by that Conference must be multiplied and continued.

6. We should focus special attention on the needs of certain groups of children: rural children who are remote from the topnotch quality services so often found in big cities; children of migratory families now treated too often as outcasts from social and health services; Negro, Indian, and Spanish-American children who too often get second- and third-best services; children of working mothers; adolescents who are having trouble finding a significant place for themselves in life. Once again, as our Armed Forces are increased, we must give special attention to the needs of children of servicemen.

7. Finally, our great media, the newspapers, magazines, radio, television, and motion pictures, have enormous powers for spreading understanding of, and concern for, children. I look to them to do an increasingly good job of public education in this field.

### Announcement to Future Essayists

**A**T THE annual session of the American Association of Orthodontists in Louisville the following recommendations of the Publication and Editorial Board were adopted and are now official:

1. That many valuable articles are lost for publication because they were not prepared for such.
2. Authors expecting to have published, without expense, a profusion of illustrations impose a difficult task upon the editorial staff.
3. That the A.A.O. should adopt official instructions for essayists, including all constituent societies, as to the manner in which their manuscripts should be prepared for publication first and for presentation second.

The contract between the American Association of Orthodontists and the C. V. Mosby Company includes a stipulated sum to be spent for the illustrations of acceptable articles for publication. Any excesses of this budget must be paid out of the treasury of the A.A.O. and may become dangerously expensive.

Accordingly the A.A.O. passed a resolution in 1949 limiting the cost of illustrating any one article appearing in the JOURNAL. In the exercise of these instructions, the Editorial Staff of the JOURNAL has been most lenient and considerate, but the budget must be held within its limit. Excess costs of illustrations may be paid by the authors or other outside sources, if desired.

Avoid delay in the publication of your essay by limiting illustrations.

GEORGE R. MOORE,

Secretary-Treasurer, A.A.O.

S. J. KLOEHN, Chairman,

Publication and Editorial Board, A.A.O.

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### Notes of Interest

Marvin A. Bregman, D.D.S., announces the removal of his office to the Park National Bldg., 100 West Park Ave., Long Beach, N. Y., practice limited to orthodontics.

Dr. Richard H. Gilmore announces his association with Dr. G. Wayne Oglestone, practice limited to orthodontics, at 703 Second National Bank Bldg., Saginaw, Mich.

John E. Gilster, D.D.S., announces the opening of his office at Suite 10 Hill Bldg., 4660 Maryland Ave., St. Louis, Mo., practice limited to dentistry for children.

Dr. Eugene L. Gottlieb wishes to announce that after Sept. 15, 1951, his practice will be limited to orthodontics at 1 Jefferson Ave., Rockville Centre, N. Y.

Dr. Neil J. Leonard announces the removal of his office to 3121 Poplar Ave., Memphis, Tenn., practice limited to orthodontics.

Dr. Edward A. Lusterman announces that his offices are now located in the Rockville Centre Medical Bldg., 165 North Village Ave., Rockville Centre, Long Island, N. Y., practice limited to orthodontics.

## OFFICERS OF ORTHODONTIC SOCIETIES

The AMERICAN JOURNAL OF ORTHODONTICS is the official publication of the American Association of Orthodontists and the following component societies. The editorial board of the AMERICAN JOURNAL OF ORTHODONTICS is composed of a representative of each one of the component societies of the American Association of Orthodontists.

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